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Revision of the genus *Melaneros* from China with a note on *Ditoneces* (Coleoptera: Lycidae)

Milada BOCÁKOVÁ

Regional Museum Olomouc, nám. Republiky 5, CZ–771 73 Olomouc, Czech Republic

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Abstract. Chinese species of the genus *Melaneros* Fairmaire, 1877 are treated in the paper. Nineteen species are recognized, of which 13 are new to science: *Melaneros businskyi* sp. n., *M. dubius* sp. n., *M. fukienensis* sp. n., *M. incurvus* sp. n., *M. infuscatus* sp. n., *M. jizushanensis* sp. n., *M. kubani* sp. n., *M. moxiensis* sp. n., *M. rubens* sp. n., *M. sichuanensis* sp. n., *M. tryznai* sp. n., *M. weihaoshanensis* sp. n. and *M. yunnanensis* sp. n. *Plateros sycophanta* Fairmaire, 1888, *Plateros formosanus* Pic, 1921 and *Plateros flavomarginatus* Kleine, 1936 are made junior synonyms of *Melaneros chinensis* (Waterhouse, 1879). *Plateros tuberculatus* Pic, 1921, *Plateros fulgens* Kleine, 1933, *Ditoneces incisicollis* Pic, 1921 and *D. sulcatithorax* Pic, 1925 are made junior synonyms of *Melaneros planatus* (Waterhouse, 1879). The species *Plateros tenebrans* Kleine, 1950 is transferred to the genus *Libnetis* Waterhouse, 1878 and species *Plateros glaber* Kleine, 1950 is transferred to the genus *Lucidina* Castelnau, 1833 of the family Lampyridae. Lectotype of *Melaneros sordidus* (Fairmaire, 1889) is designated and species *M. harmandi* (Bourgeois, 1902) is recorded from China for the first time.

Taxonomy, new species, new synonyms, lectotype designation, key, Coleoptera, Lycidae, Lampyridae, *Melaneros*, Palaearctic region

INTRODUCTION

The *Melaneros* of China have not been studied since the time of Kleine (1936, 1950). *Melaneros* species from Sri Lanka have recently been treated by Bocák & Bocáková (1990) and those from New Guinea by Bocáková (1997). So this is one of subsequent studies on the fauna of the genus from other regions.

The genus *Melaneros* is one of the largest genera of the family Lycidae which is widely distributed through all tropical regions. Within the Palaearctic region, the northern border of its distribution runs across China (from Sachalin, Ussuri region and Korea to southern slopes of the Himalayas – SE Tibet, Bhutan, Nepal, Darjeeling). Because of there is no natural interruption between the mountainous regions of western Sichuan, northwestern Yunnan and those of the Himalayas, their faunas had to be treated as a whole. Therefore, besides papers on Chinese *Melaneros* it was necessary to take into account also papers of Nakane (1983) and Kasantsev (1991, 1992).

The faunal study of Chinese *Melaneros* was quite difficult. There is a high proportion of undescribed species which are mostly indistinguishable externally. The similarity of species in external characters makes it necessary to dissect every male to verify determination. Unfortunately, because of the particular variability of both external characters and female genitalia, the identification of females is mostly impossible.

MATERIAL AND METHODS

This study is based on examination of large materials which are deposited in the following museums and collections:

BMNH – Mrs J Beard, The Natural History Museum, London;
MHNP – Dr J. Ménier, Muséum d'Histoire naturelle, Paris;
NHMB – Dr M Brancucci, Naturhistorisches Museum, Basel, Switzerland,
SMNS – Staatliches Museum für Naturkunde, Stuttgart, Germany;
ZFMK – Dr M Schmitt, Museum Alexander Koenig, Bonn;
ZMPA – Dr S A Shpinski, Zoological Institute, Warszawa,
LMBC – author's collection

As far as measurements are concerned, the eye diameters were measured in lateral views and represent maximum values. Distances between eyes were measured from above and represent minimum values. The width was measured from above and represents maximum value at humeri.

SYSTEMATIC PART

Melaneros Fairmaire, 1877

Melaneros Fairmaire, 1877: 173
Melaneros Bocák & Bocáková, 1992 255

TYPE SPECIES *Melaneros atroviolaceus* Fairmaire, 1877; by subsequent designation (Blair 1928, 99)

Distinguishing characters and redescription of the genus has been given in the previous revision of New Guinean *Melaneros* (Bocáková 1997).

Key to Chinese species of *Melaneros* – males

1 Elytra entirely black 2
– Elytra red or yellow, at most with a black basal longitudinal stripe on each elytron 5
2 Lateral margins of pronotum yellow ..... *M. chinensis* (Waterhouse)
– Whole pronotum black 3
3 Phallobase as long as half of phallus, aedeagus provided with a dorsal thorn distally (Fig 29) *M sichuanensis* **sp. n.**
– Phallobase much smaller 4
4 Eyes large (Fig 44), aedeagus ventrolaterally curved in distal half (Figs 17, 18) ..... *M. incurvus* **sp. n.**
– Eyes much smaller (Fig 43), aedeagus straight (Figs 13, 14) ..... *M fukienensis* **sp. n.**
5. Primary costa 4 strongly elevated (forming a ridge) within humeral fourth of elytra, antennae serrate, aedeagus with a stout ventrodistal projection (Figs 25, 27, 31, 34) 6
– Aedeagus without ventrodistal projection, primary costa 4 only very weakly elevated (if forming a ridge as in *M rubens* sp n , then antennae shortly flabellate – Fig 69) 9
6 Pronotum entirely black, ventrodistal projection of aedeagus curved apically (Figs 33, 34). *M businskyi* **sp. n.**
– At least lateral margins of pronotum red, ventrodistal projection of aedeagus heading ventrally or curved proximally (Figs 25, 27, 32) 7
7 Pronotum nearly rectangular with lateral margins parallel- sided (Fig 45), aedeagus with apex of ventrodistal projection curved proximally (Fig 32), male tibiae semicircularly curved (Fig. 73) ..... *M yunnanensis* **sp. n.**
– Pronotum with lateral margins divergent backwards, aedeagus with proximal margin of ventrodistal projection not proximally curved 8
8 Each elytron usually with a black basal longitudinal stripe (often reaching apical portion of elytra), aedeagus with dorsoapical sutures divergent in apical fourth of phallus (Fig 25) ..... *M sordidus* (Fairmaire)
– Elytra red, at most weakly infuscate, aedeagus with dorsoapical sutures widely divergent after a short parallel section (Fig 28) ..... *M moxiensis* **sp. n.**
9 Whole pronotum usually black, ventroapical opening of aedeagus with a stout thorn arising from its basal margin (Fig. 35). ..... *M harmandi* (Bourgeois)
– Usually only disc of pronotum black, if ventroapical opening of aedeagus present, then without any thorn on basal margin 10
10. Elytra yellow, at most with black basal longitudinal stripe on each elytron 11

– Elytra red, or whole elytra weakly infuscate. 12
11. Whole elytra yellow, pronotum with two black longitudinal spots (Fig. 37), aedeagus simple, nearly straight in ventral view (Fig 1, 2) ..... *M planatus* (Waterhouse)
– Each elytron with a short black basal longitudinal stripe, aedeagus strogly laterally curved in median portion (Figs 3, 4) ..... *M curtelineatus* (Pic)
12 Distal quarter of aedeagus strongly curved laterally, its apex bilobed (Fig 11, 12). ..... *M. infuscatus* **sp. n.**
– Apex of aedeagus not bilobed. 13
13 Aedeagus strongly dorsoventrally curved, with semicircular apical portion in lateral view (Figs 5, 20). 14
– Aedeagus nearly straight or weakly curved 15
14 Apical portion of phallus provided with 2 symmetrical spines heading proximally (Fig. 6) .... *M weibuoshanensis* sp. n
– Aedeagus without any spines (Fig 20), also strongly curved laterally. ..... *M tryznai* **sp. n.**
15 Antennae filiform, aedeagus as figured (Figs 21, 22). ..... *M. jizushanensis* **sp. n.**
– Antennae shortly flabellate 16
16 Eyes small, distance between eyes 1 5 times longer than eye diameter, aedeagus strongly widened laterally in median portion (Fig. 7). ..... *M. rubens* sp n
– Eyes large, eye diameter longer than distance between eyes 17
17 Widened distal portion of phallus longer than its simple basal part (Fig 23), pronotum black. ..... *M kubani* **sp. n.**
– *Distal half of phallus laterally widened, lateral margins of widened section nearly parallel-sided (Fig 10).* ..... *M. dubius* **sp. n.**

Melaneros chinensis (Waterhouse, 1879)
(Figs 15, 16, 51, 71)

Plateros chinensis Waterhouse, 1879: 29.
Plateros sycophanta Fairmaire, 1888: 352 – **syn. n.**
Plateros formosanus Pic, 1921 7 – **syn. n.**
Plateros flavomarginatus Kleine, 1936 264 – **syn. n.**

TYPE MATERIAL. Holotype male, Hong Kong, without other data (BMNH)
SYNONYMS I have examined holotype of *Plateros sycophanta* Fairmaire, 1888 (male, Hanoi, Tonquing, MHNP), holotype of *Plateros formosanus* Pic, 1921 (female, Formosa, MHNP) and holotype and paratype (both males – in contradistinction to Kleine, 1936) of *Plateros flavomarginatus* Kleine, 1936 (China, Canton, 25 V.1910, S V. Mell lgt., ZMPA). All the types show no differences from the holotype of *Melaneros chinensis*. Therefore, they are considered to be younger synonyms of the latter
ADDITIONAL MATERIAL EXAMINED. China: Yunnan, Jinghong, 10.–14.VII 1990, 1 male, 1 female; SW Hunan, Huilong, 500 m, 14.–23. V. 1992, CHS, 1 male, 3 females, Thailand. Kanchanaburi, 50 m, 28.VI 1993, L. Bocák lgt., 1 male (all in LMBC)

DIAGNOSIS. It differs from all other Chinese species of the genus in body coloration (largely black, only sides of prototum yellow) and in the shape of aedeagus provided with stout base of phallus.
REDESCRIPTION. Male. Body dark brown to black, only sides of pronotum yellow. Head small, hidden by pronotum, eye diameter 1.2 times longer than distance between eyes. Antennae short, reaching over anterior third of elytra, segment 1 stout, 2 small, 3 triangular, twice longer than 2, 4 the longest of all and 1.5 times longer than 3, then antennae gradually tapering apex (Fig. 71). Pronotum yellow with a longitudinal black stripe medially, trapezoidal, lateral margins weakly emarginate, anterior margin produced forwards, semicircular. Posterior angles protruding obliquely backwards. Scutellum black, nearly square, elytra weakly widened posteriorly. Male genitalia simple, proximally thickened, laterally curved in distal half (Fig. 15). Length: 5.5 mm, width: 1.7 mm. Variation. Total length: 5.1–6.3 mm.
DISTRIBUTION. S China, Taiwan, Vietnam, Thailand.

Melaneros fukienensis sp. n.
(Figs 13, 14, 43, 72)

TYPE MATERIAL. Holotype: male, China, Kuatun (Fukien), 20.VI.1946 (NHMB). Paratypes: the same data, VI., VII.1946, 2 males, 2 females (LMBC, NHMB).

ETYMOLOGY. Named in reference to the type locality.
DIAGNOSIS. Related to *M. chinensis* sp. n., but differs in entirely black pronotum and in the shape of aedeagus.
DESCRIPTION. Male. Body entirely black. Head small, distance between eyes 1.1 times longer than eye diameter. Antennae reaching elytral midlength. Segment 3 triangular, twice longer than 2 (Fig. 72), segment 4 is 1.4 times longer than 3. Pronotum with anterior margin semicircular, lateral margins weakly emarginate, posterior angles produced obliquely backwards. Elytra weakly widened posteriorly. Body length: 5.7 mm, width: 1.7 mm.
VARIATION. Total length: 5.7–8.0 mm.

Melaneros incurvus sp. n.
(Figs 17, 18, 44, 70)

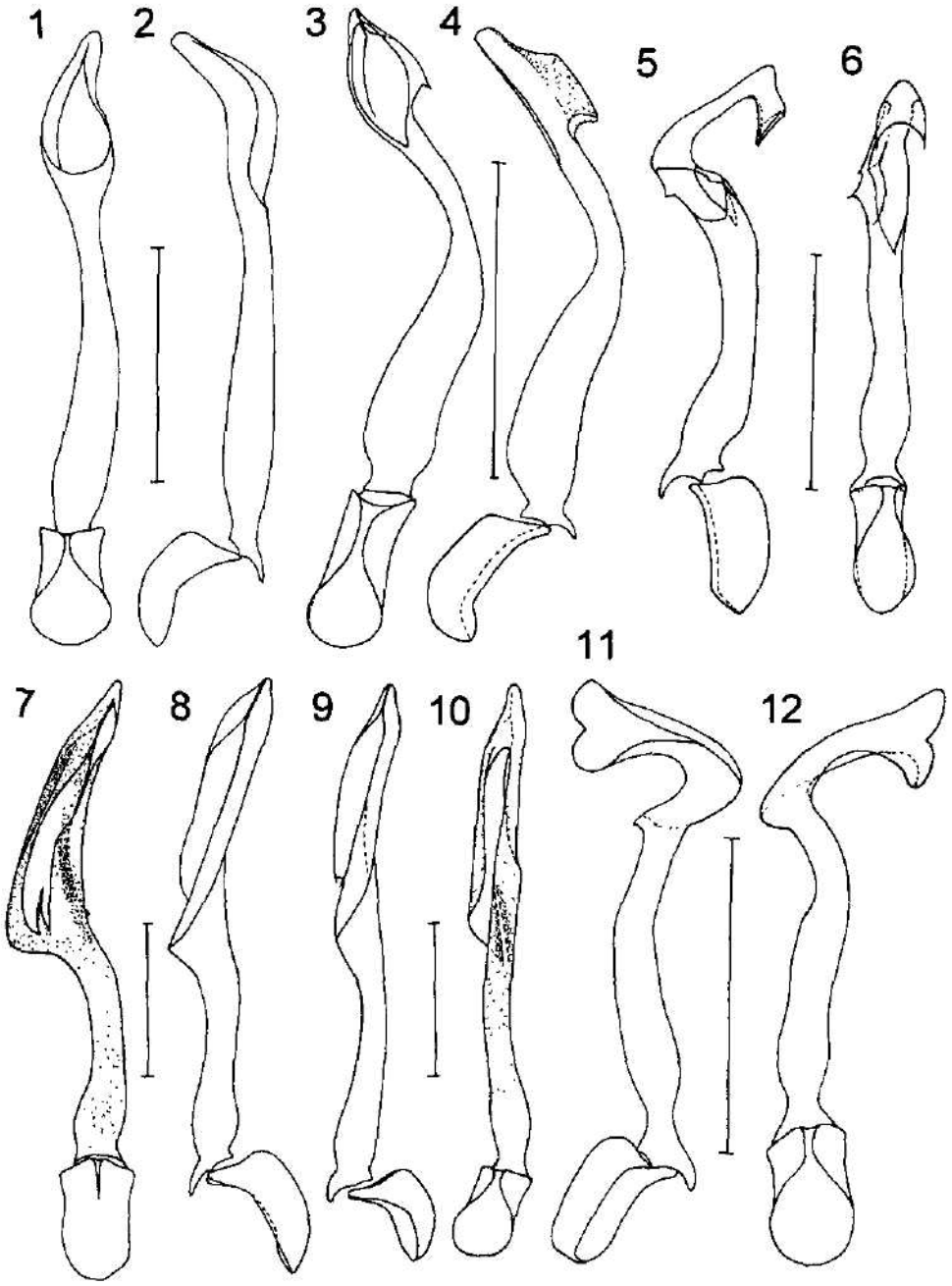
TYPE MATERIAL. Holotype: male, China, Kuatun, Fukien, 22.V.1946, leg. Tschung-Sen (NHMB). Paratypes: China, Kuatun, Fukien, 22.V.–2.VII.1946, leg. Tschung-Sen, 3 males, 6 females (NHMB, LMBC); Kuatun, 27.40N, 117.40E, J. Klapperich lgt., V.–VI.1938, 1 male, 4 females (ZFMK, LMBC); Kwangtseh – Fukien, 27.VII.1937, J. Klapperich lgt. 1 female (ZFMK); Vietnam bor., Tam Dao, V.1990, J. Picka lgt., 1 male (LMBC).

ETYMOLOGY. Named according to the shape of phallus.
DIAGNOSIS. *M. incurvus* sp. n. differs from the other black *Melaneros* in having simple, in median portion laterally curved aedeagus.
DESCRIPTION. Male. Whole body dark brown to black. Head with large eyes in males, eye diameter 1.2 times longer than distance between eyes. Antennae reaching elytral midlength, segment 3 long, segment 4 only 1.15 times longer than 3 (Fig. 70). Pronotum with anterior margin strongly produced forwards, lateral margins weakly converging anteriorly. (Fig. 44). Elytra nearly parallel-sided. Male genitalia with strongly thickened basal portion of phallus which is abruptly curved laterally in median portion (Fig. 17). Length: 4.9 mm, width: 1.2 mm.
VARIATION. Total length: 4.9–6.6 mm.

Melaneros planatus (Waterhouse, 1879)
(Figs 1, 2, 37, 55)

Plateros planatus Watchouse, 1879: 27.
Plateros tuberculatus Pic, 1921: 6 – **syn. n.**
Ditoneces incisicollis Pic, 1921: 5 – **syn. n.**
Ditoneces sulcatithorax Pic, 1925: 18 – **syn. n.**
Plateros fulgens Kleine, 1933: 20 – **syn. n.**

TYPE MATERIAL. Holotype: male, N. China (BMNH).
SYNONYMS. I have examined holotype of *Ditoneces sulcatithorax* Pic (male, China, Kiautschau, MHNP), holotype of *Ditoneces incisicollis* Pic (female, China, MHNP), holotype of *Plateros tuberculatus* Pic (female, Chin van Tao, MHNP) and lectotype of *Plateros fulgens* Kleine (male, India, Punjab, Kangra Valley, X.1899, Dudgeon lgt., BMNH). Because of all the types show no differences from the holotype of *Melaneros planatus*, they are considered to be younger synonyms of the latter.
ADDITIONAL MATERIAL EXAMINED. China: N Yunnan, Lijiang, 2600 m, 30.VI.–2.VII.1990, 2 males, 1 female; Yunnan, Yipinglang, 1800 m, 8.–10.VII.1993, 1 male; Jizushan, 6.–10.VII.1994, 2500–2700 m, 2 females; Sichuan, Guanxian, 600 m, 12.–14.VII.1990, 1 female (all in LMBC).



Figs 1–12. Aedeagus in ventral and lateral views. 1–2: *Melaneros planatus* (Waterhouse); 3–4: *M. curtelineatus* (Pic); 5–6: *M. weibaoshanensis* sp. n.; 7–8: *M. rubens* sp. n.; 9–10: *M. dubius* sp. n.; 11–12: *M. infuscatus* sp. n. Scale = 0.5 mm.

REDESCRIPTION. Male. Body dark brown, pronotum, scutellum and elytra yellow, discal area of pronotum sometimes infuscate. Eyes large in males, eye diameter as long as distance between eyes. Antennae weakly serrate (Fig. 55) in males, segments 3 and 4 triangular, nearly of the same length. Pronotum with anterior margin produced forwards, lateral margins emarginate (Fig. 37), posterior angles projected laterally. Scutellum nearly square, elytra weakly widened posteriorly. Male genitalia simple (Fig. 1), with an opening in distal third of phallus, apex curved ventrally. Length: 5.8 mm, width: 1.5 mm.
VARIATION. Total length: 5.6–9.5 mm.
DISTRIBUTION. S China, Taiwan, Thailand, Vietnam.

Melaneros curtelineatus (Pic, 1926)
(Figs 3, 4, 38, 56)

Plateros curtelineatus Pic, 1926: 31.

TYPE MATERIAL. Holotype: female, Yunnan, Pan Nau Kei (MHNP).
ADDITIONAL MATERIAL EXAMINED. China, Yunnan, Weibaoshan, VII.1993, CHS, 1 male, 1 female; N Yunnan, 2600 m, 30.VI.–2.VII.1990, 1 female; Yunnan, 10.–13.VII.1996, 28.06 N, 98.52 E, 3700 m, Hengduan mts. – part Meili 1 male, 1 female (all in LMBC).

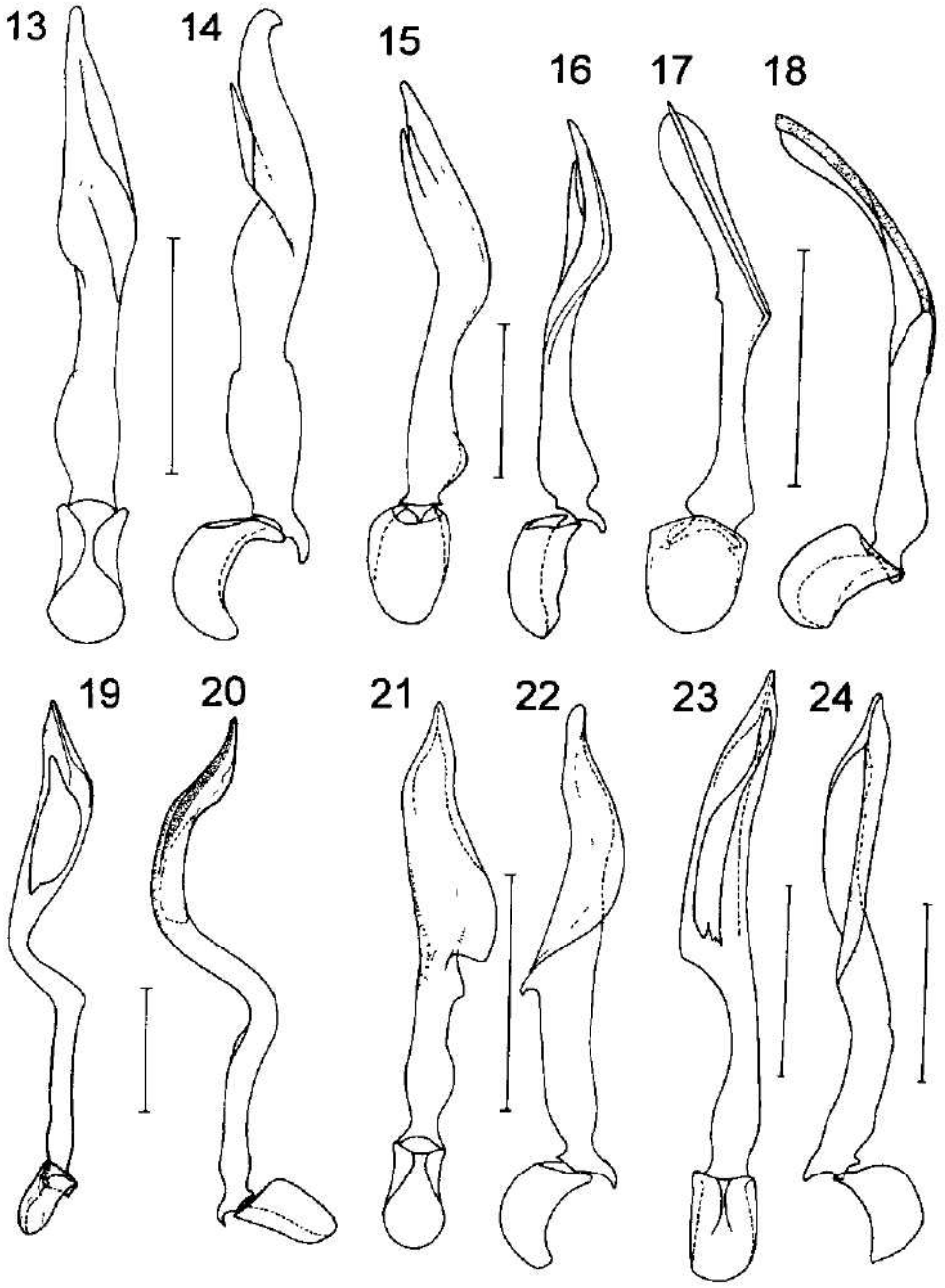
REDESCRIPTION. Male. Body dark brown to black, pronotal margins yellow, elytra yellow with a short longitudinal black stripe in basal third of each elytron. Whole suture and margins of elytra yellow. Head with large eyes, distance between eyes 1.2 times longer than eye diameter. Antennae reaching elytral midlength, weakly serrate (Fig. 56), segment 4 is 1.2 times longer than 3. Pronotum with lateral margins parallel, posterior angles weakly protruding laterally. Pronotum black, anterior and lateral margins yellow. Elytra nearly parallel-sided, weakly widened backwards in posterior half. Male genitalia resemble those of *M. planatus* but aedeagus is strongly laterally curved and stout proximally (Fig. 3). Body length: 6.0 mm, width: 2.0 mm.
VARIATION. Total length: 5.6–7.9 mm.

Melaneros harmandi (Bourgeois, 1902)
(Figs 35, 36, 39, 60)

Plateros harmandi Bourgeois, 1902: 92.

MATERIAL EXAMINED. NE India, Darjeeling, Chittray, Lalimp. 300 m, 8. V. 1987, Ch. J. Rai, 1 male (det. Kasantsev, comp. au type, NHMB); E Nepal, Arun Valley, Bhotebas-Sakurate, 1750–2000 m, 6.VI. 1988, leg. Lebisch & Probst, 1 male (LMBC); China, Yunnan, Yulongshan mts., 3500 m, Baishui, 7.–12.VII.1990, 1 male (LMBC); Dali, 1600–2000 m, 5.–8.VII.1990, 1 male, 3 females (LMBC).

REDESCRIPTION. Male. Body black, only elytra (except a basal longitudinal stripe on each elytron) yellowish red. Sometimes also sides of pronotum rather lighter. Head small, eye diameter 1.3 times longer than distance between eyes. Antennae short reaching basal third of elytra. Segment 3 triangular, 1.4 times longer than 2, segment 4 also 1.4 times longer than 3. Pronotum trapezoidal, anterior margin nearly straight, posterior angles acute (Fig. 39). Elytra widened backwards, primary costa 4 strongly elevated in humeral portion. Male genitalia hooked distally, with a thorn in apical opening, provided with a dorsoapical projection (Figs 35, 36). Length: 4.9–6.8 mm, width: 1.3–1.8 mm.
DISTRIBUTION. Bhutan, SW China, India: Darjeeling, Nepal, Sikkim.
REMARK. This is the first record of the species from China.



Figs 13–24. Aedeagus in ventral and lateral views. 13–14. *Melaneros fukienensis* sp. n.; 15–16: *M. chinensis* (Waterhouse); 17–18: *M. incurvus* sp. n.; 19–20 *M. tryznai* sp. n.; 21–22: *M. jizushanensis* sp. n.; 23–24. *M. kubani* sp. n. Scale = 0.5 mm.

Melaneros sichuanensis sp. n.
(Figs 29, 30, 50, 65)

TYPE MATERIAL. Holotype: male, Sichuan, Moxi, E of Gongashan, 2700 m, 22.–24.VII.1992 (LMBC).

ETYMOLOGY. Named in reference to the type locality.
DIAGNOSIS. It is the only entirely black *Melaneros* known from Sichuan.
DESCRIPTION. Male. Whole body entirely black. Head with medium-sized eyes, eye diameter 1.25 times longer than distance between them. Antennae nearly filiform (Fig. 65), segment 4 is 1.4 times longer than 3. Pronotum trapezoidal, lateral margins nearly straight, posterior angles acute. Elytra widened backwards, reticulate cells well developed. Male genitalia provided with a stout dorsal thorn apically (Fig. 29). Body length: 6.2 mm, width: 1.7 mm.

Melaneros sordidus (Fairmaire, 1889)
(Figs 25, 26, 42, 59)

Plateros sordidus Fairmaire, 1889: 36.

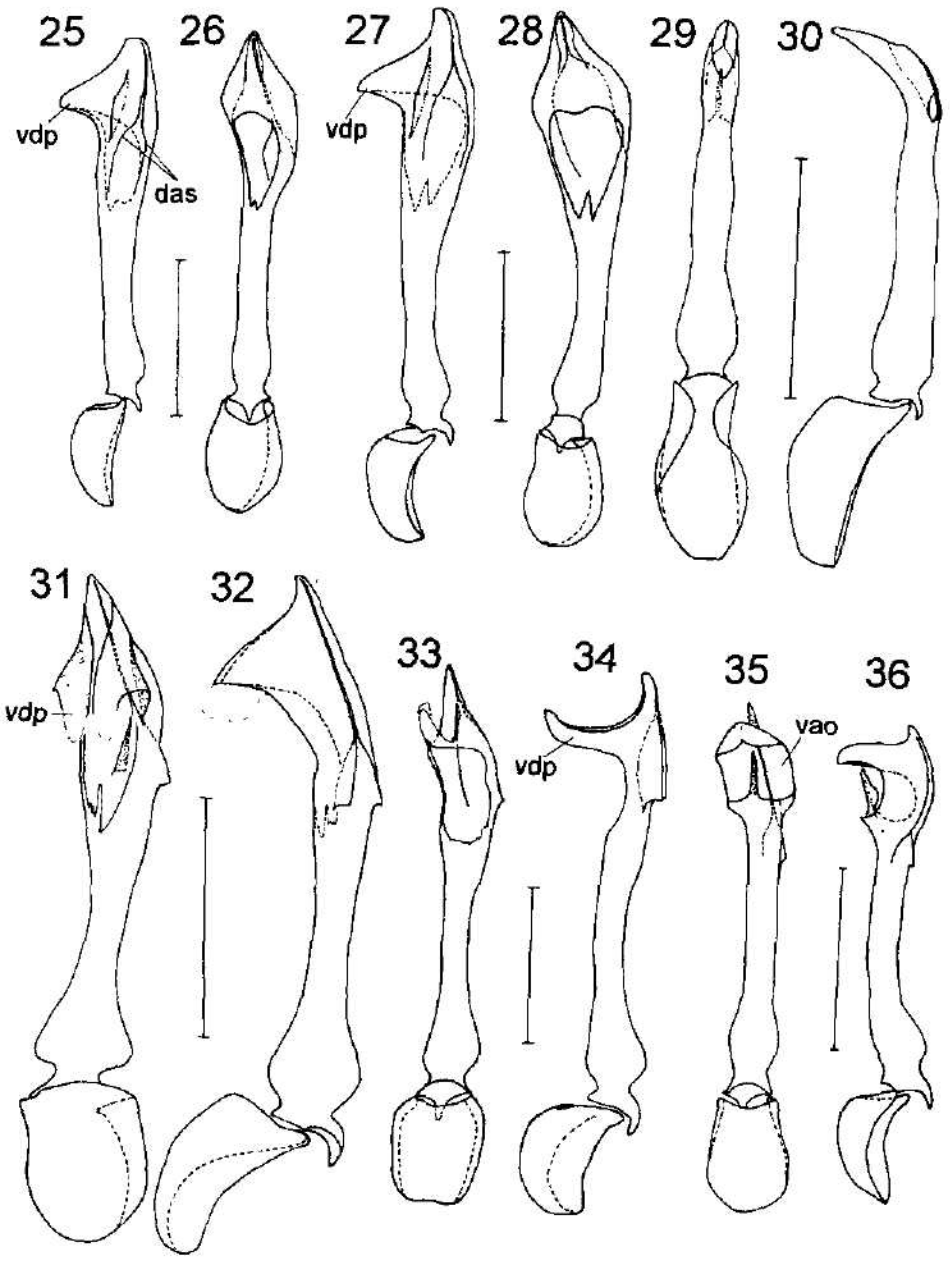
TYPE MATERIAL. Lectotype: male (hereby designated), Chine, A. David lgt. (MHNP); paralectotypes: the same data, 2 females (MHNP).
ADDITIONAL MATERIAL EXAMINED. China, Yunnan, Dongchuan, 1500–3200 m, 28.6.–3.7.1994, 1 male, 3 females (LMBC).

REDESCRIPTION. Male. Body dark brown to black, only pronotum and elytra red, sometimes only lateral margins of pronotum as well as suture and lateral margins of elytra red. Head small, partly hidden by pronotum, eyes small, distance between eyes 1.6 times longer than eye diameter. Antennae reaching elytral midlength, segment 1 stout, 2 small, 3 triangular, 1.5 times longer than 2, segment 4 is 1.6 times longer than 3, then antennae gradually tapering apex. Elytra weakly widened backwards. Male genitalia with phallus strongly widened in distal half provided with ventrodistal projection, dorsoapical sutures diverging in distal fourth of phallus (Fig. 25). Length: 5.5 mm.
VARIATION. Total length: 5.1–6.3 mm, width: 1.6–1.8 mm.

Melaneros moxiensis sp. n.
(Figs 27, 28, 40, 57)

TYPE MATERIAL. Holotype: male, China, Sichuan, Moxi, E of Gongashan, 2700 m, 22.–24.VII.1992 (LMBC). Paratypes: the same data, 4 males, 5 females (LMBC, NHMB, SMNS), Gongashan, 28.VI.–2.VII.1994, 1650 m, 2 females; Sichuan, Liziping, 28.VI.–3.VII.1991, 1 female (LMBC).

ETYMOLOGY. Named in reference to the type locality.
DIAGNOSIS. Related to *M. sordidus* but differs in having whole elytra red without black stripes (elytra at most infuscate) and in broader phallus only weakly emarginate laterally.
DESCRIPTION. Male. Body dark brown to black, only pronotum and elytra red. Eyes small, distance between eyes 1.6 times longer than eye diameter. Antennae slender, segment 3 triangular, 1.3 times longer than 2, 4 is 1.5 times longer than 3, following segments gradually tapering apex. Pronotum transverse (Fig. 40), lateral margins divergent posteriorly, weakly emarginate, posterior angles projected obliquely backwards. Scutellum black. Elytra weakly widened backwards, primary costa 4 strongly elevated in humeral portion. Male genitalia stout (Fig. 27, 28) with an opening ventrodistally and a ventral projection. Length: 5.8 mm, width: 2.4 mm.
VARIATION. Total length: 5.0–7.2 mm.



igs 25–36. Aedeagus in ventral and lateral views. 25–26: *Melaneros sordidus* (Fairmaire); 27–28: *M. moxiensis* sp. n.; 29–
0: *M. sichuanensis* sp. n.; 31–32: *M. yunnanensis* sp. n.; 33–34: *M. businskyi*; 35–36: *M. harmandi* (Bourgeois). Scale =
5 mm. Abbreviations: vdp – ventrodistal projection; das – dorsoapical sutures; vao – ventroapical opening of aedeagus.

Melaneros yunnanensis sp. n.
(Figs 31, 32, 45, 62, 73)

TYPE MATERIAL. Holotype: male, China, Yunnan, Dali zhou, Huadianba, 2800 m, 23.VII.1993 (LMBC). Paratypes: the same data, 4 males, 3 females (LMBC, NHMB, SMNS).

ETYMOLOGY. Named in reference to the type locality.
DIAGNOSIS. Related to *M. sordidus* from which it differs in having whole elytra red, lateral margins of pronotum nearly parallel-sided and in the shape of aedeagus which is much broader in proximal portion.
DESCRIPTION. Male. Body dark brown, only pronotum and elytra red, scutellum black. Head with very small eyes, distance between eyes twice longer than eye diameter. Antennae with segment 3 short, only 1.6 times longer than 2, segment 4 stout, 1.1 times longer than 5 (Fig. 62). Pronotum with anterior margin straight, not produced forwards, lateral margins nearly parallel-sided (Fig. 45), posterior angles acute. Elytra widened backwards, primary costa 4 elevated in basal third. Legs with tibiae semicircularly curved (Fig. 73). Phallus strongly thickened proximally, provided with ventrodistal opening (Fig. 31). Length: 7.0 mm, width: 1.8 mm.
VARIATION. Total length: 7.0–7.6 mm.

Melaneros businskyi sp. n.
(Figs 33, 34, 41, 61)

TYPE MATERIAL. Holotype: male, China, E Tibet, valley SW of Tangmai & env., 30°02'–07'N 95°01'–07'E, 2100–2300 m, 4.–5. VII. 1996 (LMBC). Paratype: female, the same data (LMBC).

ETYMOLOGY. Named in honour of Roman Businský (Praha, Czech Republic).
DIAGNOSIS. Related to *M. sordidus* from which it differs in having whole pronotum black and in the shape of aedeagus with a long ventroapical projection.
DESCRIPTION. Male. Body black, only elytra yellow (except basal longitudinal stripe on each elytron), whole suture yellow. Head with small eyes, distance between eyes 1.4 times longer than eye diameter. Antennae with segment 3 short, only 1.3 times longer than 2, segment 4 stout, wider than 3 and 1.8 times longer than 3 (Fig. 61). Segment 4 as long as 5. Pronotum with anterior margin nearly straight, posterior angles protruding obliquely backwards (Fig. 41). Elytra slightly widened posteriorly, primary costa 4 strongly elevated in basal portion. Aedeagus with a ventrolateral opening and strong apical projection heading ventrally (Figs 33, 34). Length: 6.9 mm, width: 1.9 mm.

Melaneros tsinensis (Pic, 1926)

Plateros tsinensis Pic, 1926: 23.

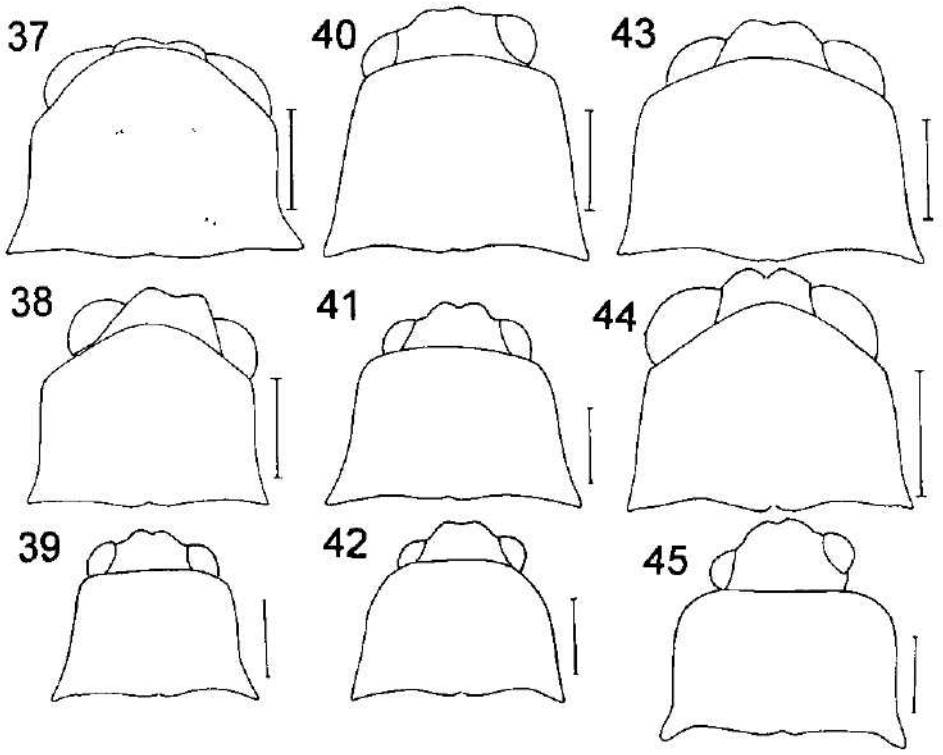
TYPE MATERIAL. Holotype: female, Yunnan, Pe Yen Tsin, coll. de Touzalin (MHNP).

REDESCRIPTION. Female. Body black, only elytra and margins of pronotum red, scutellum of the same colour as pronotal disc. Head hidden beneath pronotum, eyes small. Antennae reaching elytral midlegth, segment 1 stout, 2 small, 3 triangular, 4 is 1.3 times longer than 3, antennae from segment 4 serrate. Pronotum transverse, lateral margins nearly parallel in anterior half, posterior angles protruding obliquely backwards. Elytra weakly widened backwards. Female genitalia with short gonosubcoxites (valvifers), gonostyli of holotype missing. Body length: 8.6 mm, width: 2.4 mm.

Melaneros infuscatus sp. n.
(Figs 11, 12, 52, 66)

TYPE MATERIAL. Holotype: male, China, Yunnan, Weibaoshan, VII. 1993, ChS (LMBC) Paratypes: the same data, 2 female (LMBC).

ETYMOLOGY. Named according to the body coloration.
DIAGNOSIS. It resembles *M. tsinensis* but differs in elytra infucate in anterior portion.
DESCRIPTION. Male. Body black, only elytra reddish brown and basally infuscate, covered with red pubescence. Anterior margin of pronotum rather lighter. Head only partly hidden by pronotum, distance between eyes as long as eye diameter. Antennal segment 3 triangular, segments 4 – 9 strongly serrate (Fig. 66), 4 is 1.2 times longer than 3. Pronotum black, transverse, anterior margin semicircular, lateral margins divergent backwards, posterior angles acute (Fig. 52). Elytra weakly widened backwards. Male genitalia laterally curved at apex, distal portion widened, heading ventrally (Fig. 11). Body length: 5.8 mm, width: 1.5 mm.
VARIATION. Total length: 5.0–5.8 mm.



Figs 37–45 Head and pronotum 37. *Melaneros planatus* (Waterhouse), 38: *M. curtelineatus* (Pic); 39: *M. harmandi* (Bourgeois); 40 *M. moxiensis* sp. n.; 41 *M. businskyi* sp. n.; 42: *M. sordidus* (Fairmaire), 43: *M. fukienensis* sp. n., 44: *M. incurvus* sp. n.; 45: *M. yunnanensis* sp. n. Scale = 0.5 mm.

Melaneros weibaoshanensis sp. n.
(Figs 5, 6, 53, 58)

TYPE MATERIAL. Holotype: male, China, Yunnan, Weibaoshan Mts., 1800–2500 m, E slope, 1.VII 1992 (LMBC). Paratype male, Yunnan, Lugu lake – Luo Shui, 8.–9 VII.1992 (LMBC)

ETYMOLOGY. Named in reference to the type locality.
DIAGNOSIS. It seems to be related to *M. infuscatus* sp. n. but differs in having weakly serrate antennae, red pronotum and in the shape of phallus provided with an apical opening.
DESCRIPTION. Male. Body dark brown to black, only pronotum and elytra red, scutellum and discal area of pronotum reddish brown. Eyes small, distance between eyes 1.5 times longer than eye diameter (Fig. 53). Antennae weakly serrate (Fig. 58), segment 3 is 2.4 times longer than 2, segment 4 is 1.5 times longer than 3. Pronotum trapezoidal (Fig. 53), posterior angles acute, divergent obliquely backwards. Elytra nearly parallel-sided. Male genitalia with an opening distally and 2 teeth on dorsal margin of the opening and another two hooked thorns at apex (Fig. 5, 6). Body length: 6.4 mm, width: 1.6 mm.

Melaneros tryznai sp. n.
(Figs 19, 20, 54)

TYPE MATERIAL. Holotype: male, China, Sichuan, Dayi Dafeishui Forest, cca 110 km W of Chengdu, 22 VI 1993 (LMBC)

ETYMOLOGY. Named in honour of Miloš Trýzna (Ústí nad Labem, Czech Republic).
DIAGNOSIS. Species distinguished from all other known *Melaneros* by having the aedeagus strongly dorsoventrally and also laterally curved in median portion, provided with a ventroapical opening (Fig. 19).
DESCRIPTION. Male. Body dark brown, only elytra red brown with red pubescence. Head small, distance between eyes 1.1 times longer than eye diameter. Pronotum trapezoidal, anterior margin produced forwards (Fig. 54), posterior angles obliquely prominent. Scutellum black, weakly emarginate apically. Elytra slightly widened posteriorly. Aedeagus as long as half of elytra, strongly curved laterally in median portion, with ventroapical opening (Figs 19, 20). Length: 5.6 mm; width 1.5 mm.
REMARK. Antennae of the holotype missing.

Melaneros rubens sp. n.
(Figs 7, 8, 46, 69)

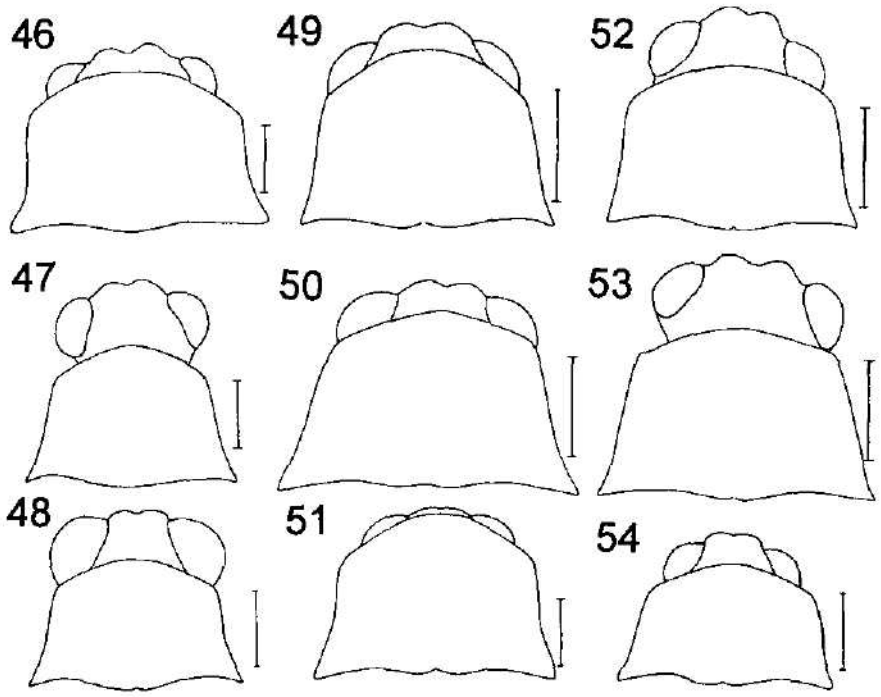
TYPE MATERIAL. Holotype: male, China, Yunnan, 27°08N, 100°14E, Yulongshan mts., 2900–3500 m, Baishui, 7.–12.VII 1990 (LMBC). Paratypes: the same data, 2 males (NHMB, LMBC); Habashan mts., 3000–3800 m, 27.20N, 100 09E, E slope, 13 –27 VII 1992, 1 male (LMBC)

ETYMOLOGY. Named in reference to the body coloration.
DIAGNOSIS. It seems to be related to *M. rubripennis* from which it differs in having much smaller eyes, flabellate antennae and in laterally curved aedeagus.
DESCRIPTION. Male. Body dark brown, only pronotal margin and elytra red. Head small, distance between eyes 1.5 times longer than eye diameter. Antennae shortly flabellate (Fig. 69). Pronotum transverse, anterior margin semicircular, lateral margins emarginate (Fig. 46), posterior angles projected obliquely backwards. Elytra widened backwards, often infuscate basally, humeral portion of primary costa 4 weakly elevated. Male genitalia strongly laterally curved in median portion (Fig. 7). Body length: 8.2 mm, width: 2.2 mm.
VARIATION. Total length: 7.4–8.8 mm.

Melaneros dubius sp. n.
(Figs 9, 10, 47, 68)

TYPE MATERIAL. Holotype male, China Yunnan, Weibaoshan mts, W slope, 2000–2800 m, 25.11N, 100 24E, 25.–28 VI 1992 (LMBC) Paratypes the same data, 1 male (LMBC); N Yunnan, 30 km N of Lijiang, 3000 m, 3.VII 1990, Jizu mts, 18 – 20.VII 1995, 2 males (LMBC, NHMB).

ETYMOLOGY. Dubius (Lat.) – doubtful, refers to its close relationship to *M. rubens* sp. n.
DIAGNOSIS. It differs from related *M. rubens* sp. n. in having much larger eyes, longer branches of antennae and in slender, less curved aedeagus.
DESCRIPTION. Male. Body dark brown to black, only pronotum and elytra red. Eyes large, eye diameter 1.1 times longer than distance between eyes. Antennae flabellate (Fig. 68). Pronotum transverse, lateral margins strongly emarginate, anterior margin produced forwards, posterior angles acute (Fig. 47). Scutellum weakly emarginate apically. Elytra slightly widened posteriorly. Male genitalia slender, laterally widened in distal half (Fig. 10). Body length: 8.5 mm, width: 2.2 mm.
VARIATION. Total length: 7.5–8.5 mm.



Figs 46–54 Head and pronotum. 46: *Melaneros rubens* sp. n., 47: *M. dubius* sp. n.; 48: *M. kubani* sp. n.; 49 *M. jizushanensis* sp. n., 50. *M. sichuanensis* sp. n.; 51. *M. chinensis* (Waterhouse); 52: *M. infuscatus* sp. n.; 53: *M. weibaoshanensis* sp. n., 54: *M. tryznai* sp. n. Scale = 0.5 mm.

Melaneros kubani sp. n.
(Figs 23, 24, 48, 67)

TYPE MATERIAL. Holotype: male, China, Yunnan, 2300 m, Jizu mts., 18.–20.III. 1995, Bolm lgt. (LMBC). Paratype: female, Yunnan, 27° 08'N, 100° 14'E, Yulongshan mts., Baishui, 2900–3500 m, 7.–12.VII.1990 (LMBC).

ETYMOLOGY. Named in honour of Vít Kubáň (Brno, Czech Republic).
DIAGNOSIS. Related to *M. rubens* sp. n. from which it differs in having much larger eyes in males and in the shape of aedeagus.
DESCRIPTION. Male. Body black, only elytra and margins of pronotum red. Head with large eyes, eye diameter 1.3 times longer than distance between eyes. Antennae shortly flabellate (Fig. 67). Pronotum trapezoidal, lateral margins weakly emarginate (Fig. 48). Elytra slightly widened backwards, covered with red pubescence. Male genitalia resemble those of *M. rubens* sp. n., but lateral margins of distal half of phallus only weakly divergent proximally (Fig. 23). Length: 6.4 mm; width: 1.7 mm.

Female differs from the male in having much smaller eyes, filiform antennae and in rectangular shape of pronotum. Variation. Total length: 6.2–6.4 mm.
REMARK. An aedeagus of a male was inserted in the female genitalia of the paratype.

Melaneros jizushanensis sp. n.
(Figs 21, 22, 49, 64)

TYPE MATERIAL. Holotype: male, Yunnan, Jizu mts., 2300 m, 18.–20.VII.1995 (LMBC). Paratype: male, the same data (LMBC).

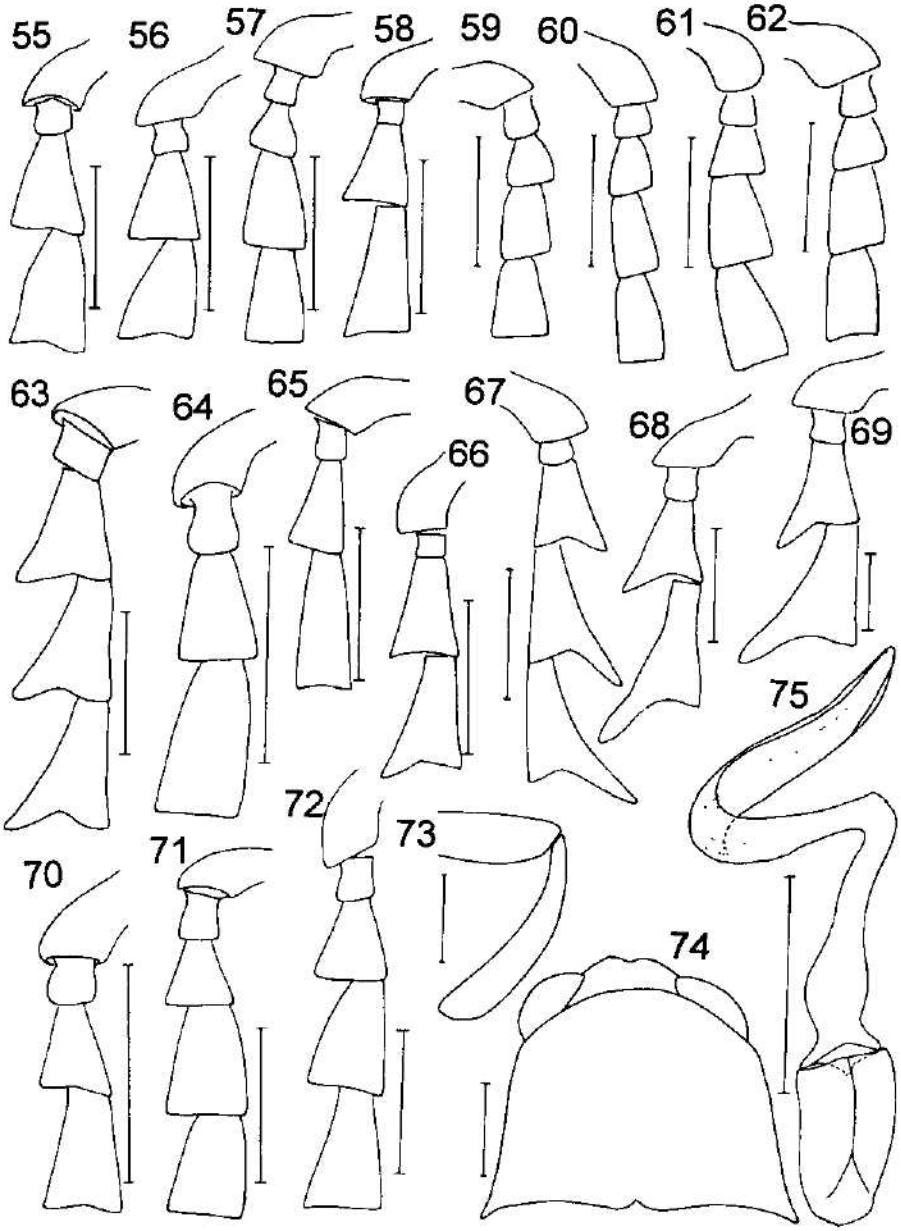
ETYMOLOGY. named in reference to the type locality.
DIAGNOSIS. It seems to be related to *M. rubens* sp. n. from which it differs in having filiform antennae and in the shape of aedeagus.
DESCRIPTION. Male. Body black, only margins of pronotum and elytra red. Head small, distance between eyes 1.25 times longer than eye diameter. Antennae filiform (Fig. 64), reaching elytral midlength, segment 3 much shorter than 4. Pronotum transverse (Fig. 49), lateral margins nearly parallel in anterior portion, posterior angles projected obliquely backwards. Elytra weakly widened posteriorly. Male genitalia stout (Fig. 21) widened in distal half, provided with a mediolateral dent. Body length: 5.8 mm, width: 1.4 mm.
VARIATION. Total length: 5.8–7.0 mm.

Ditoneces propinquus Waterhouse, 1879
(Figs 63, 74, 75)

Ditoneces propinquus Waterhouse, 1879: 32.

TYPE MATERIAL. Holotype: male, China (BMNH).

REDESCRIPTION. Body dark brown to black, pronotum (except discal area), scutellum and elytra yellow, trochanters and bases of femora yellowish brown. Head with large eyes, eye diameter as long as distance between eyes. Antennae serrate (Fig. 63). Segment 4 is 1.5 times longer than 3. Pronotum with anterior margin semicircular, lateral margins nearly straight, divergent backwards, posterior angles acute (Fig. 74). Elytra slightly widened backwards. Body length: 5.8 mm, width: 1.8 mm.



Figs 55–75. 55–72: Basal antennal segments. 55: *Melaneros planatus* (Waterhouse); 56: *M. curtelineatus* (Pic); 57: *M moxiensis* sp. n.; 58: *M. weibaoshanensis* sp. n.; 59: *M. sordidus* (Fairmaire); 60: *M. harmandi* (Bourgeois); 61: *M. businskyi* sp. n.; 62: *M. yunnanensis* sp. n.; 63: *Ditoneces propinquus* Waterhouse; 64: *Melaneros jizushanensis* sp. n.; 65: *M. sichuanensis* sp. n.; 66: *M. infuscatus* sp. n.; 67: *M. kubani* sp. n.; 68: *M. dubius* sp. n.; 69: *M. rubens* sp. n.; 70: *M. incurvus* sp. n.; 71: *M. chinensis* (Waterhouse); 72: *M. fukienensis* sp. n.; 73: Hind leg of *M. yunnanensis* sp. n.; 74: Pronotum of *Ditoneces propinquus* Wath.; 75: Aedeagus of *D. propinquus* Waterhouse. Scale = 0.5 mm.

Libnetis tenebrans (Kleine, 1950) comb. n.

Plateros tenebrans Kleine, 1950 22

TYPE MATERIAL Holotype female, Kuatun (Fukien), 2300 m, 27 40 n Br, 117 40 o L, 2 VI 1938, leg J Klapperich (ZFMK)

REMARK On the basis of the examination of holotype, the species is transferred to the genus *Libnetis* Waterhouse, 1878

Lucidina glaber (Kleine, 1950) comb. n.

Plateros glaber Kleine, 1950 22

TYPE MATERIAL Holotype female, Kuatun, 20 V 1938 (ZFMK)

REMARK On the basis of the study of holotype, the species *Plateros glaber* is transferred to the genus *Lucidina* Laporte de Castelnau, 1833 (Lampyridae)

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The status of *Tetraplatypus* (Coleoptera: Carabidae: Stenolophina) and larval description of *Bradycellus ruficollis* and *B. verbasci*

Karel HŮRKA

Department of Zoology, Charles University, Viničná 7, CZ–128 44 Praha 2, Czech Republic

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Abstract Three larval instars of *Bradycellus* (*Bradycellus*) *verbasci* (Duftschmidt, 1812) and *Bradycellus* (*Tetraplatypus*) *ruficollis* (Stephens, 1828) are described and illustrated. Data on larval development and the breeding type of both species are mentioned. Differential diagnosis of the subgenus *Tetraplatypus* Tschitschérine, 1897, based on the larval characters, including several autapomorphies, is given. Differential diagnoses of the genus and subgenus *Bradycellus* Erichson, 1837 are also presented. A key to the subgenera and species of *Bradycellus* known in the larval stage is added.

Taxonomy, larval taxonomy, key, breeding type, Coleoptera, Carabidae, *Bradycellus*, Palaearctic region

INTRODUCTION

Tetraplatypus (type species: *Acupalpus similis* Dejean, 1829) differs from *Bradycellus* s. str. in the adult stage mainly by the slightly dilated middle tarsi of male, bearing adhesive setae ventrally; dorsal surface of all tarsi is glabrous in both taxa. Most of the recent authors consider these differences as insufficient for a subgeneric separation and they synonymized *Tetraplatypus* with *Bradycellus* s. str. (e. g. Lindroth 1968, 1986; Kryzhanovskij et al. 1995). Nevertheless, the found larval autapomorphies suggest for the subgeneric validity of *Tetraplatypus*. According to Lindroth (1968: 884), males of the Nearctic *Bradycellus fenderi* Hatch, 1951 also have the dilated meso-tarsi and would belong to *Tetraplatypus*.

Out of more than one hundred species of the genus *Bradycellus*, only four species are known in larval stage: *B.* (*Stenocellus*) *rupestris* (Say, 1823) (van Emden 1942, Chu 1945), *B.* (*Bradycellus*) *caucasicus* (Chaudoir, 1846), *B.* (*B.*) *csiki* Laczó, 1912 (Arndt 1991) and *B.* (*Tachycellus*) *glabratus* Reitter, 1894 (Matalin 1996). The larval descriptions of further two species, *B.* (*Bradycellus*) *verbasci* and *B.* (*Tetraplatypus*) *ruficollis*, are given below, together with the larval differential diagnoses of the genus *Bradycellus* and the subgenera *Bradycellus* and *Tetraplatypus*.

MATERIAL AND METHODS

Three larval instars (3 L_1, 3 L_2, 4 L_3) of *Bradycellus* (*B.*) *verbasci* are reared ex ovo, according to the technique described by Hůrka (1972). The adults are found in Praha-Kyje (5953, 30.VII.1992), in flight to light, leg. P. Veselý.

Three larval instars (15 L_1, 14 L_2, 6 L_3) of *Bradycellus* (*Tetraplatypus*) *ruficollis* are collected in field by sifting of *Calluna vulgaris* litter in Nehvizdy (5854, central Bohemia, 14. VII.1969) and in Praha-Troja (5852, 29.IV., 5.V., 2 VI 1993), leg. K. Hůrka.

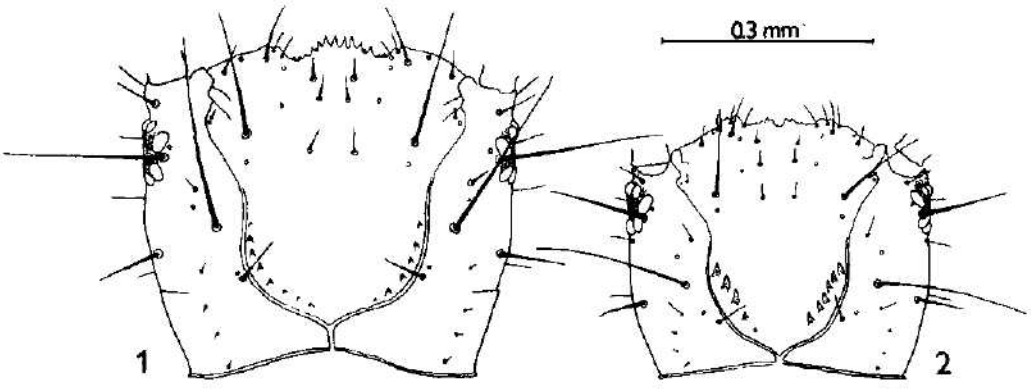
For comparative purpose larvae of following taxa have been studied: *Acupalpus* (*Acupalpus*) *parvulus* (Sturm, 1825), *A.* (*A.*) *suturalis* Dejean, 1829, *Bradycellus* (*Bradycellus*) *caucasicus* (Chaudoir, 1846), *B.* (*B.*) *csiki* Laczó, 1912, *Dicheirotrichus gustavi* Crotch, 1870, *D. rufithorax* (C. R. Sahlberg, 1827), *Trichocellus placidus* (Gyllenhal, 1827), *Stenolophus discophorus* Fischer v. Waldheim, 1824, *S. mixtus* (Herbst, 1784).

All larvae are deposited in the Collectio Hůrka of the Charles University Praha, Department of Zoology. The notation of setae and pores follows that of Bousquet & Goulet (1984) and Bousquet (1985).

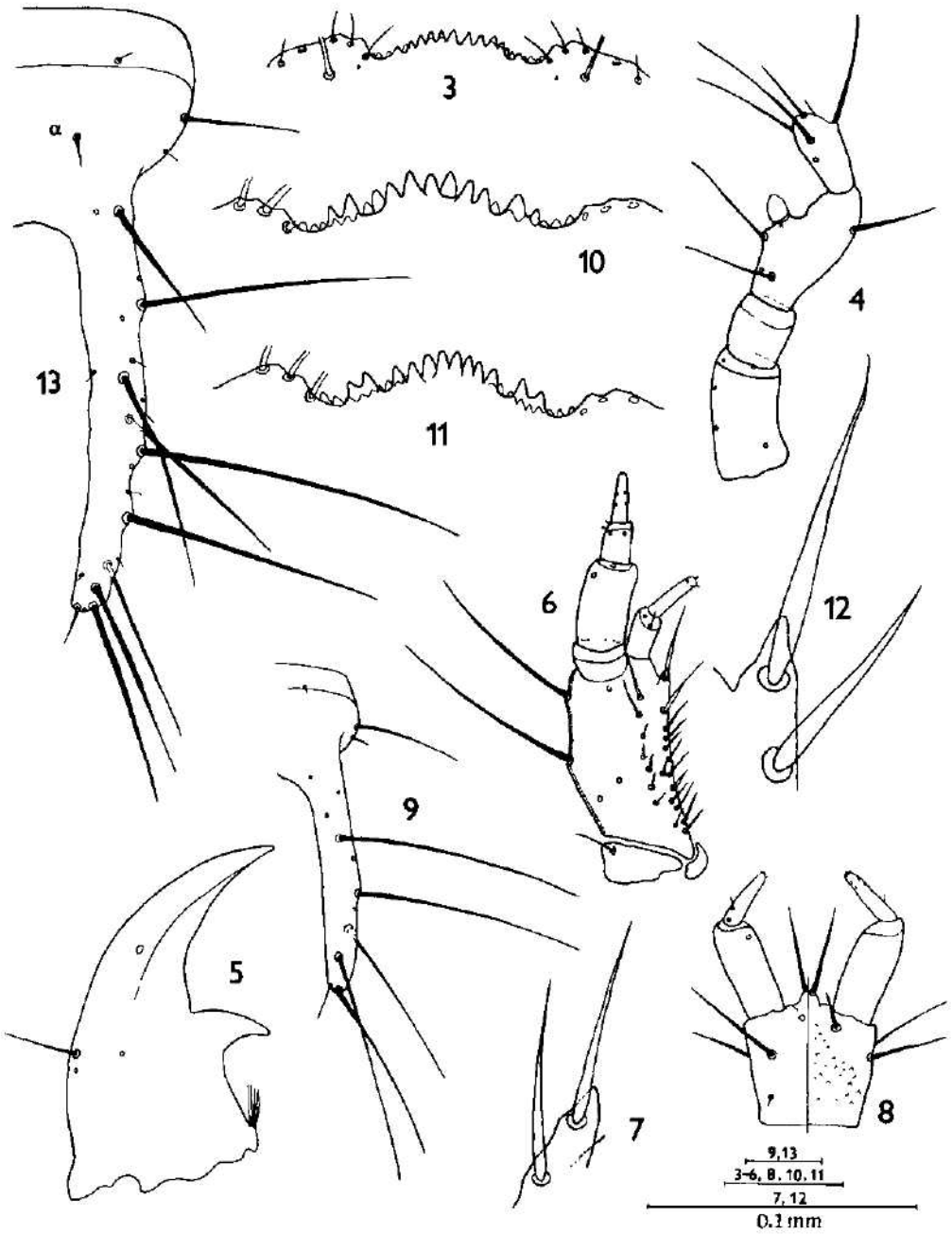
DESCRIPTION

Bradycellus (*Bradycellus*) *verbasci* (Duftschmid, 1812)

COLOUR. Head chocolate-brown, thoracic and abdominal terga brown to yellow-brown.
FIRST INSTAR. Head: cephalic capsule transverse, width/length ratio 1.17 (n=2); nasale slightly projecting, with two rows of teeth (Fig. 3); egg-bursters with 7–8 spinules on each side along frontal suture, reaching the level of PA_7; cervical groove short, extending dorsally the space between setae PA_3 and PA_5 (Fig. 1); coronal suture about half as long as antennomere IV; retinaculum located below middle of mandible (Fig. 5); group gMX with 18–21 setae (Fig. 6); lacinia broad, with moderately prolonged apex, seta MX_6 as long as MX_5 (Fig. 7); width of cephalic capsule 0.50–0.52 ($\bar{x}$=0.51, n=3). Abdomen: urogomphi rather long, 1.6–2.0 times as long as width of tergum IX (Fig. 9).
SECOND INSTAR. Head: cervical groove reaching dorsally PA_5; coronal suture of about 0.67 length of antennomere IV; group gMX with 20–22 setae; MX_6 longer than MX_5; width of cephalic capsule 0.56–0.59 ($\bar{x}$=0.58, n=3). Thorax: femora with 4 spiniform secondary setae. Abdomen: all tergites with distinct keel separating praetergum from tergum; UR_α short.
THIRD INSTAR. Head: coronal suture of about 0.80 length of antennomere IV; group gMX with 21–26 setae; MX_6 distinctly longer than MX_5 (Fig. 12); width of cephalic capsule 0.67–0.81 ($\bar{x}$=0.76, n=4). Abdomen: urogomphi 1.55–1.60 times as long as width of tergum IX, UR_α distinct, about twice as long as in L_2 (Fig. 13).
BIONOMIC NOTES. Rearing. Three males and seven females were kept from August 20, 1992 in the laboratory at m. t. 21 °C (min. 14 °C, max. 26 °C) and under natural light conditions. Mating of two paires was observed on September 14. Twelve L_1 were found from October 10 to November 23. The development of 7 L_1 lasted at m. t. 16.5 °C (min. 9 °C, max. 21 °C) in average 8.8 (7–10) days. Four L_2 developed at the same m. t. 11, 11, 12 and 18 days. All L_3 were fixed, one



Figs 1–2. Cephalic capsule of 1: *B.* (*Bradycellus*) *verbasci* (Duftschmid), 2: *B.* (*Tetraplatypus*) *ruficollis* (Stephens).



Figs 3–13. *B.* (*Bradycellus*) *verbasci* (Duftschmid). 3: nasale of L_1, 4: antenna of L_1, 5: mandible of L_1, 6: maxilla of L_1, 7: lacinia of L_1, 8: labium of L_1, 9: tergum IX and urogomphus of L_1, 10, 11: nasale of L_3, 12: lacinia of L_3, 13: tergum IX and urogomphus of L_3.

specimen after 3 month keeping in laboratory conditions given. The parental adults were kept also further three months under 10 h L/14 h D and at m. t. 15 °C (min. 4 °C, max. 20 °C), no eggs or larvae were found.

Bradycellus verbasci belongs to the species with larval and probably also with imaginal dormancy and the autumnal propagation in its annual cycle.

Bradycellus (*Tetraplatypus*) *ruficollis* (Stephens, 1828)

Colour. Head brown-yellow, mandibles and teeth of nasale darker, thoracic terga and abdominal sclerites light brown-yellow.

First instar. Head: cephalic capsule transversal, quadrangular, sides almost parallel, width/length ratio 1.13–1.15 ($\bar{x}$=1.14, n=7) (Fig. 2); nasale with a single row of 11–14 teeth, interrupted in middle by a large gap, size of teeth increasing toward middle (Fig. 14); egg-bursters consist of 5–7 strong spines on each side along frontal suture, reaching over the level of PA_7, regularly different number on each side; cervical groove absent; coronal suture very short, nearly point-like (Fig. 2); retinaculum located near middle of mandible (Fig. 16); group gMX with 7–10 setae (Fig. 17); lacinia short, with pointed apex (Fig. 18), MX_6 nearly as long as MX_5; maxillary palpomere II markedly longer than palpomere III; both galeomeres of about equal length (Fig. 17); width of cephalic capsule 0.41–0.44 ($\bar{x}$=0.42, n=15) mm. Thorax: femur shorter than tibia and tarsus combined. Abdomen: urogomphi short, 1.05–1.17 ($\bar{x}$=1.12, n=7) times as long as width of tergum IX (Fig. 20).

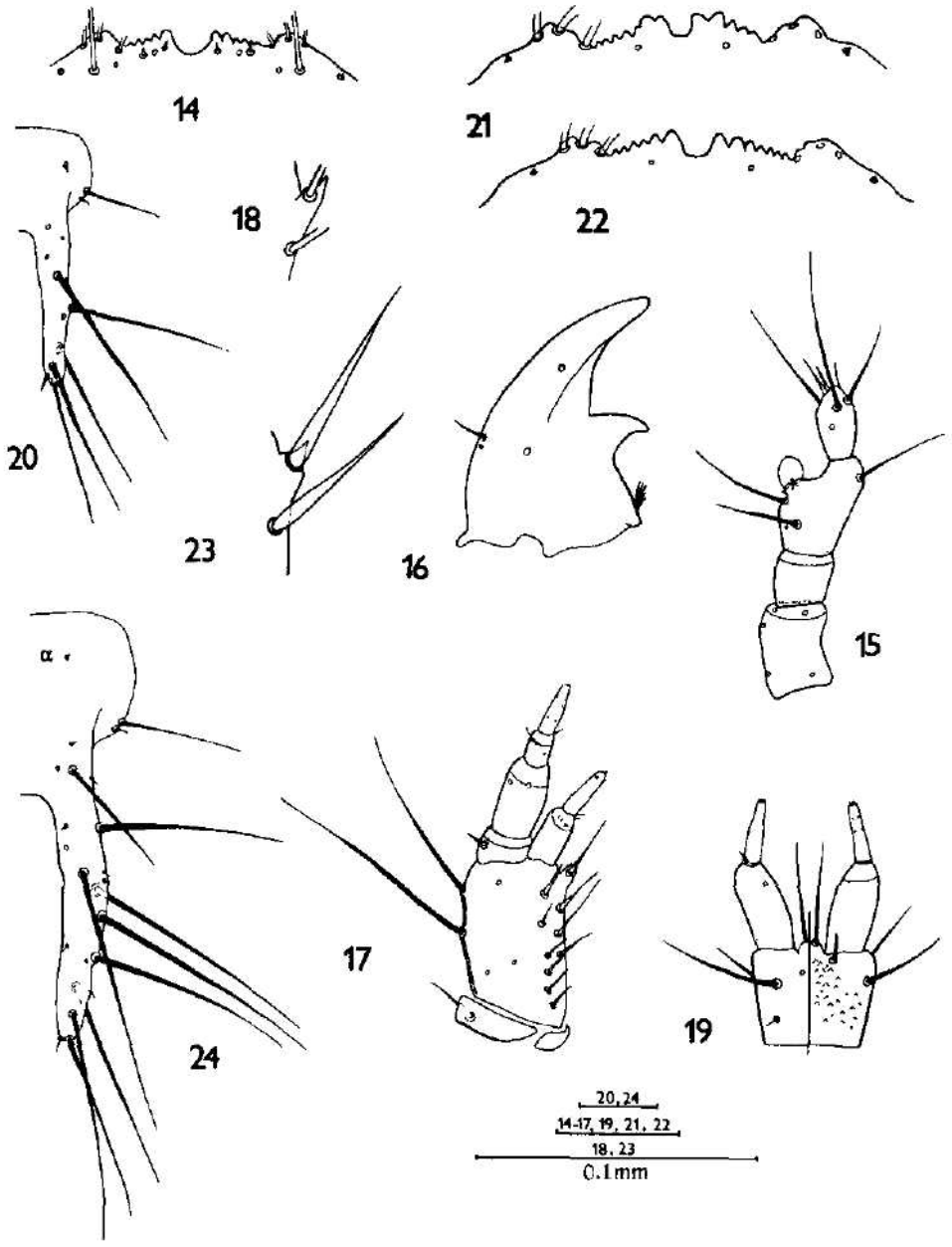
Second instar. Head: width/length ratio 1.14–1.20 ($\bar{x}$=1.17, n=8); coronal suture a little more than one third of antennomere IV length; MN_α present; group gMX with 8–10 setae; width of cephalic capsule 0.44–0.49 ($\bar{x}$=0.47, n=14) mm. Thorax: femora with 2 spiniform secondary setae. Abdomen: all tergites without distinct keel separating praetergum from tergum; urogomphi 1.05–1.30 ($\bar{x}$=1.22, n=9) times as long as width of tergum IX. UR_α very short or absent unilaterally.

Third instar. Head: coronal suture of one half to two thirds of antennomere IV length; group gMX with 8–11 setae; MX_6 distinctly longer than MX_5 (Fig. 23); width of cephalic capsule 0.52–0.57 ($\bar{x}$=0.54, n=6) mm; urogomphi 1.02–1.14 ($\bar{x}$=1.10, n=5) times as long as width of tergum IX; UR_α short or absent unilaterally (Fig. 24).

Bionomic notes. All three larval instars were found in Praha-Troja in 1993 by sifting of *Calluna* leaf litter: 20 L_1 on April 29, 58 L_1, 4 L_2 on May 5, 3 L_1, 10 L_2, 5 L_3 on June 2; on August 11 no larvae were found; two teneral adults (male and female) were collected on September 22. One second instar larva and one third instar larva were found in sifted *Calluna* litter in Nehvizdy (central Bohemia) on July 14, 1969. According to Schjotz-Christensen (1966) *B. ruficollis* reproduces in Denmark in very late autumne and early spring. Our data confirm the early spring propagation also for the central Europe. There is a trophic relationship between the *Calluna* stands and this ground beetle species. The analysis of guts of *B. ruficollis* adults from a northwest German sandy heathland revealed a predominance of *Calluna* seeds (67.2%) in the ingested food (Melber 1983).

Differential diagnosis of *Tetraplatypus* Tschitschérine, 1897

Head quadrangular, brown-yellow; dorsal sclerites light brown-yellow. Nasale with only dorsal row of teeth, interrupted in middle by a large gap, size of teeth increasing toward middle. In L_1 egg-bursters consist of 5–7 strong spines on each side along sinuses of frontal suture. Cervical



Figs 14–24. *B.* (*Tetraplatypus*) *ruficollis* (Stephens). 14: nasale of L_1, 15: antenna of L_1, 16: mandible of L_1, 17: maxilla of L_1, 18: lacinia of L_1, 19: labium of L_1, 20: tergum IX and urogomphus of L_1, 21, 22: nasale of L_3, 23: lacinia of L_3, 24: tergum IX and urogomphus of L_3.

groove absent. Group gMX with 7–11 setae; lacinia small, short, with pointed apex; maxillary palpomere II markedly longer than palpomere III; galeomere II as long as galeomere I. Antennomere IV distinctly longer than sclerotized part of antennomere II. MN_α in L_2–L_3 single. Femur shorter than tibia and tarsus combined, in L_2–L_3 with 2 spiniform secondary setae. Abdominal tergites in L_2–L_3 without keel separating praetergum from tergum. Urogomphi short, 1.02–1.30 times as long as width of tergum IX; UR_α in L_2–L_3 small or absent unilaterally.

Autapomorphies of *Tetraplatypus*: nasale with a single row of teeth, interrupted by a large gap in middle; cervical groove absent; group gMX with only 7–11 setae; femora in L_2–L_3 with only 2 spiniform secondary setae; all abdominal tergites in L_2–L_3 without keel separating praetergum and tergum.

Differential diagnosis of *Bradycellus* Erichson, 1837

Arndt (1991) presented the differential diagnosis of the genus *Bradycellus* in the larval stage. Matalin (1996) gave differential diagnoses of the genus *Bradycellus* and the subgenera *Bradycellus* s. str., *Stenocellus* Casey, 1914 and *Tachycellus* Morawitz, 1862. Our new data enable to precise the differential diagnoses of both the genus and the subgenus *Bradycellus* as follows.

Genus *Bradycellus*. Cephalic capsule transversal, width/length ratio 1.13–1.28, sides slightly rounded. Nasale slightly protruding, with one (upper) or too (upper and lower) rows of teeth; teeth of the upper row larger, 8–14, teeth of the lower row smaller, more numerouse. Egg-bursters in L_1 with 5–9 spinules or spines along the frontal sutures which are more situated than in instars L_2, L_3. Cervical groove present or absent. Group gMX with 7–26 setae. MN_α in L_2–L_3 present or absent. Femur in L_2–L_3 with 2–5 spiniform secondary setae. Abdominal tergites in L_2–L_3 with or without keel separating praeterga and terga; seta TE_{II} and secondary setae on abdominal tergites very small. Urogomphi from nearly as long as, to 2.5 times longer than, width of tergum IX; UR_α in L_2–L_3 small and indistinct to large and distinct.

Subgenus *Bradycellus*. Head transversal, narrowed toward base, chocolate-brown; dorsal sclerites brown to brown-yellow. Nasale with 8–12 large teeth in upper row and with smaller teeth of same length in lower row. In L_1 egg-bursters consist of 6–9 spinules on each side along sinuses of frontale suture. Cervical groove indistinct, short, reaching dorsally seta PA_3 or space between setae PA_3 and PA_5. Group gMX with 16–26 setae; lacinia large, with blunt apex; maxillary palpomere II markedly longer than palpomere III; galeomere II as long as galeomere I. Antennomere IV distinctly longer than sclerotized part of antennomere II. MN_α in L_2–L_3 single. Femur shorter than tibia and tarsus combined, in L_2–L_3 with 4–5 spiniforme secondary setae. Abdominal tergites in L_2–L_3 with transversal keel separating praetergum and tergum. Urogomphi 1.1–2.0 times as long as width of tergum IX; UR_α in L_2–L_3 from small and indistinct to large, distinct.

Key to the subgenera and species of *Bradycellus* in the larval stage

1 (4) Head brown-yellow or light brown; nasale with only one (upper) row of teeth, if nasale with two (upper and lower) rows of teeth, then teeth of lower row markedly smaller

2 (3) Head light brown, nasale with two rows of teeth, retinaculum directed forwards, MN_α in L_2–L_3 with 3 setae; cervical grooves long; abdominal tergites in L_2–L_3 with keel separating praetergum and tergum. Width of cephalic capsule in L_1 0.63–0.66 mm, in L_2 0.68–0.72 mm, in L_3 0.78–0.87 mm . . . . . *B. (Tachycellus) glabratus* Reitter

3 (2) Head brown-yellow; nasale with one row of teeth, retinaculum directed inwards, MN_α in L_2–L_3 with 1 seta, cervical grooves absent, abdominal tergites in L_2–L_3 without keel separating praetergum and tergum. Width of cephalic capsule in L_1 0.41–0.44 mm, in L_2 0.44–0.49 mm, in L_3 0.52–0.57 mm . . . . . *B. (Tetraplatypus) ruficollis* (Stephens)

4 (1) Head dark brown, nasale with two rows of teeth of similar length

5 (6) Cervical groove distinct, long, reaching almost PA_5 dorsally; maxillary palpomere II as long as palpomere III, MN_a in L_2–L_3 absent, femur distinctly longer than tibia and tarsus combined; abdominal tergites in L_2–L_3 without keel separating praetergum from tergum. Width of cephalic capsule in L_3 0.60 mm ..... *B. (Stenocellus) rupestris* Say

6 (5) Cervical groove indistinct, short, reaching PA_3 dorsally or space between PA_3 and PA_5; maxillary palpomere II markedly longer than palpomere III; MN_a in L_2–L_3 present; femur distinctly shorter than tibia and tarsus combined; abdominal tergites in L_2–L_3 with keel separating praetergum from tergum ..... *B. (Bradycellus)* s. str.

7 (8) Urogomphi longer, at least 1.6 times as long as width of tergum IX. Width of cephalic capsule in L_1 0.50–0.52 mm, in L_2 0.56–0.59 mm, in L_3 0.67–0.81 mm. ..... *B. (B.) verbasci* (Duftschmid)

8 (7) Urogomphi shorter, at most 1.3 times as long as width of tergum IX.

9 (10) UR_a in L_2–L_3 distinct, longer. Width of cephalic capsule in L_1 0.47 mm, in L_2 0.53–0.56 mm, in L_3 0.62–0.69 mm ..... *B. (B.) csikii* Laczó

10 (9) UR_a in L_2–L_3 indistinct, short. Width of cephalic capsule in L_1 0.43–0.50 mm, in L_2 0.48–0.57 mm, in L_3 0.59–0.67 mm ..... *B. (B.) caucasicus* (Chaudoir)

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BOOK REVIEW

RIPERT C (coordonnateur) **Épidémiologie des maladies parasitaires.** Tome 1 **Protozooses.** Cachan Editions Médicales Internationales, 1996 393 pp Format 155×240 mm Softcover, price 560 – FF ISBN 2–7430–0076–7

The editor is professor of medical parasitology affiliated with the University and chairman of the Laboratory of Biology at the Saint Andrew's Hospital in Bordeau His coauthors are F -X Pajot, research director at ORSTOM (French Institute for Scientific Research, Development and Cooperation), Professor P Vincendeau and Dr F Equerdo-Gomez, ex collaborator of the World Health Organization The preface has been compiled by P de Raadt, honorary director of the parasitic diseases program at WHO **The Introduction** provides insights into general terms elucidating epidemiological aspects of protozooses in humans taxonomical terminology, tropical climates, formations of tropical plants as are forests, savanna, jungle and mangroves, further epidemiological terms, demography and geographical distribution, modes of transmission, morbidity and mortality, vectors, hosts and reservoirs, epidemiology and public health Five chapters, subdivided into sections (subchapters) follow by considering major protozooses of medical importance, particularly in regard to the international classification of diseases Each chapter is constructed by a general frame, yet it is characterized by biological peculiarity and diversity of protozoan parasites and their arthropod vectors, and by wide range of disease processes Included is detailed coverage of particular parasitic diseases, namely the history, morphology and parasite life cycles, cultivation media, immune responses, pathogenesis, pathological anatomy and fysiology, clinical manifestations, laboratory procedures, therapy suggesting essential drug regimens, ways of spreading, the methodology of prevalence surveys, principles of prevention and control Significant attention is paid to the arthropod vectors of importance in transmission of disease-producing protozoic agents **Chapter 1** is concerned with intestinal protozooses – entamoebiasis caused by *Entamoeba histolytica* and other enteropathogenic or commensal amoebae of the family Entamoebidae *E dispar E hartmanni E polecki, E coli Endolimax nana Iodamoeba buetschlii* and *Duentamoeba fragilis* In following section discussed are the *Giardia lamblia* and giardiasis, and intestinal flagellate protozoans including *Chilomastix mesnili Trichomonas hominis Enteromonas hominis* and *Retortamonas intestinalis* Concluding section covers the balantidiasis – a protozoonosis caused by the trichostomatid ciliate *Balantidium coli* **Chapter 2** deals with malaria by considering the complex biological cycle of malarial plasmodia, the knowledge of which is indispensable for effective control strategies and for the evaluation and management of the illness Looked at are epidemiological surveys, diverse biological properties of particular plasmodial species and strains, natural and acquired resistance, malariometric indices, classification of endemicity, urban and rural malaria, and more A detailed section features anopheline mosquitoes, namely their classification, morphology, anatomy and biology of particular life stages It has been estimated that about 400 anopheline species occur throughout the world Following section focuses on principles of malaria control There is a list of antimalarial drugs enclosing the newer ones as artemisinine derivates and avotaquone Chemoresistance tests and the control of vectors, including the insecticides – are also looked at **Chapter 3** offers insights into the African sleeping sickness when discussing the Gambian an Rhodesian trypanosomes Particular sections of this chapter are devoted to taxonomic classification and biology of trypanosomes belonging into the groups Stercoraria and Salivaria Reviewed are antigenic variants of trypanosome surface glycoproteins A detailed section features biology, morphology, pathogenic and epidemiologic role of tsetse flies as disease vectors belonging to three subgenera – *Austenina Glossina* and *Nemorhina* – there is a list of about 30 species Additionally, lists of reservoir animals, afflicted African countries, principal control measures and other important data are presented **Chapter 4** centers attention upon American trypanosomiasis – Chagas disease, mainly on its epidemiological, pathological and clinical conditions In a review of afflicted countries in Latin America geographical, climatic, and population characteristics are listed Seroprevalence rates are illuminated in a tabular review Moreover, presented are the biology of *Trypanosoma cruzi* in reduviid bugs and a comprehensive overview of Latin American hosts belonging to six mammalian orders (see tabular appendices 1 and 2) **Chapter 5** provides coverage of visceral and cutaneous leishmaniases in the Old and New Worlds Presented is a list of 11 species and subspecies of the subgenera *Leishmania* and *Viannia* responsible for several clinically distinctive disorders Morphology, development, biology, control and classification of principal vectors – sandflies of the genera *Phlebotomus* and *Lutzomyia* belonging to the family Psychodidae are described in complete detail **Chapter 6** ensures comprehensive coverage of toxoplasmosis and its causative agent – the coccidian *Toxoplasma gondii* Information is provided on the complex life cycle of the parasite, and epidemiological and clinical aspects of the disease Not omitted are the molecular biology, immunity and laboratory investigations including miscellaneous modifications of enzyme immunoassay This excellent text is extensively illustrated by 134 figures composed of charts, schematic line drawings of protozoan life cycles, presentations of pathological aspects, histograms and graphs depicting long-term follow up of miscellaneous epidemiological, biological and entomological indices, morphology and internal structures of arthropod vectors, reservoir animals and laboratory tests In addition, there are 18 tables presenting prevalence rates, distribution of protozoic diseases in the world, taxonomical reviews, and identification keys The volume provides a latest relevant information on medical protozoology with special regard to epidemiology and vectorial biology A French reading zoologist, parasitologist, entomologist, epidemiologist or infectious and tropical diseases specialist will find here updated information on pathology clinic and therapy of major protozoic infections which are subject of interest of special program of WHO One may miss treatise of some other protozoan parasites in humans – *Trichomonas vaginalis* intestinal Coccidia babesiae, pathogenic free living amoebae or Microsporidia The second volume in preparation will cover helminthic infections

Jindřich Jíra

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A review of Chinese *Aphodius* species (Coleoptera: Scarabaeidae). Part 5: subgenus *Aphodius*

David KRÁL

Department of Zoology, Charles University, Viničná 7, CZ–128 44 Praha 2, Czech Republic

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Abstract. Chinese species of the nominotypical subgenus of *Aphodius* Illiger, 1798 are reviewed. *A.* (*A.*) *reginae* sp. n. from Yunnan is described and compared with two closely related species, *A.* (*A.*) *elegans* and *A.* (*A.*) *fasciger* Harold, 1881. Lectotype and paralectotypes for *A.* (*A.*) *calichromus* Balthasar, 1932 are designated. *A.* (*A.*) *foetens* (Fabricius, 1787) and *A.* (*A.*) *frater* Mulsant et Rey, 1870 both from the Xinjiang province, and *A.* (*A.*) *irregularis* Westwood in Royle, 1839 from the Xizang province, are recorded from China for the first time. Key to the species of the subgenus *Aphodius* known from China and the Himalayas is provided, their epipharynges and male genitalia are figured. Status of *Aphodius plasoni* Kaufel, 1914 is discussed and it is considered a junior synonym to *A.* (*A.*) *elegans* Allibert, 1847

Taxonomy, new species, lectotype designation, key, distribution, Coleoptera, Scarabaeidae, *Aphodius*, subgenus *Aphodius*, Palaearctic region, Oriental region

INTRODUCTION

According to the recent world catalogue (Dellacasa 1988a) the nominotypical subgenus of the genus *Aphodius* Illiger, 1798 is represented by 15 species known to occur throughout the whole Palaearctic region. Three species, *A.* (*A.*) *calichromus*, *A.* (*A.*) *elegans* and *A.* (*A.*) *fasciger* are also distributed in northeastern parts of the Oriental region. Placing of *A. bidentatus* A. Schmidt, 1906 (e. g. Schmidt 1922) described from Colorado into the nominotypical subgenus is for the moment only of preliminary nature. Eight species including one new described in this paper and *A.* (*A.*) *frater* placed in Dellacasa (1988a) in the subgenus *Loraspis* Mulsant et Rey, 1869 are currently known from China. In Dellacasa (1988a) *Aphodius emerichi* Reitter, 1892 and *A. elongatulus* (Fabricius, 1801) are also listed as *Aphodius* s. str. The former was described from Siberia ("Suifunmündung") based on a female specimen. I had an opportunity to study the holotype kept in HNHM. In my opinion it is most of all identical with *A.* (*Agrilinus*) *ater* (De Geer, 1774) widespread polytypical species also inhabiting northeastern part of China. The latter species, also known from southern parts of China, belongs in my opinion to the subgenus *Alocoderus* Schmidt, 1913 that will be reviewed in one of the next parts of the review.

MATERIAL AND METHODS

Mouthparts of at least three specimens, if available, of each species under study, were dissected for examination of epipharyngeal structures. The dissected mouthparts were mounted in the Liquide de Swann on permanent slides and examined with stereoscopic microscope Meopta. All permanent slides are deposited in DKCP. Morphological terminology concerning epipharyngeal structures was adopted from Dellacasa (1983).

The following codes (after Arnett et al 1993) identify the collections housing the material examined

DEIC – Germany, Eberswalde-Finow, Deutsches Entomologisches Institut (L Behne),
DKCP – Czech Republic, Praha, David Král collection,
JRCP – Czech Republic, Poděbrady, Jiří Rejsek collection,
HNHM – Hungary, Budapest, Hungarian Natural History Museum (O Merkl, G Szel),
MHNG – Switzerland, Genève, Museum d'Histoire naturelle (I Lobl),
MNHN – France, Paris, Museum national d'Histoire naturelle (Y Cambefort),
NMPC – Czech Republic, Praha, National Museum (Natural History) (J Jelinek),
RCCP – Czech Republic, Praha, Radek Červenka collection,
RMOC – Czech Republic, Ostrava, Regional museum (J Vávra),
ZMAS – Russia, St Petersburg, Zoological Museum, Academy of Sciences (B M Kataev, M G Volkovich),
ZMHB – Germany, Berlin, Museum für Naturkunde der Humboldt Universitat (F Hieke, M Uhlig)

Specimens (and relevant permanent slides) of the newly described species are provided with one red printed label "[Name of a taxon] sp n , HOLOTYPUS, ALLOTYPUS or PARATYPUS with No, [sex mark for male or female], David Kral det 1997" In the case of lectotype and/or paralectotype designation, each specimen bears a red printed label "[Name of a taxon] LECTOTYPUS or PARALECTOTYPUS with No, [sex mark for male or female], David Kral design 1997" Exact label data are cited for the material, separate labels are indicated by slashes (/) Author's remarks and complementations are found in square brackets, [p] – preceding data within quotation are printed, [h] – the same but handwritten, MS – manuscript, HT – holotype, AT – allotype, PT – paratype, x/y – number of males / number of females

SYSTEMATIC PART

Aphodius (Aphodius) calichromus Balthasar, 1932
(Figs 1, 9, 10)

Aphodius (Aphodius) calichromus Balthasar, 1932a *98*, 1932b *115–118*, 1964 *363*, *367–368*, Dellacasa, 1988a *103*, 369

TYPE LOCALITY Tatsienlu, Szetschwan [= Kangding; China: Sichuan prov.] (Balthasar 1932)

TYPE MATERIAL EXAMINED Lectotype and 9 paralectotypes by present designation lectotype (male) and paralectotypes No 1 (male) and Nos 2–5 (females) "Tatsienlu [= Kangding] – Kiulung, Em Reitter [p] / Typus [h red label] / Det Dr Balthasar [p] A calichromus m [Balthasar's MS]", all in NMPC, paralectotypes Nos 6–8 (males) "Nitou Tatsienlu [= Kangding], Szechuan [= Sichuan], China [p] / TYPUS [p red label] / Aphodius s str calichromus m [Balthasar's MS] Dr Balthasar det [p]", all in MHNG, paralectotype No 9 (male) "Nitou Tatsienlu [= Kangding], Szechuan [= Sichuan], China [p] / Typus [p red label] / A calichromus Type m [Balthasar's MS] Dr Balthasar det [p]", in ZMHB

ADDITIONAL MATERIAL EXAMINED **China, Fujian** Kuatun [= Huaqiao] (2300 m) 27 40n Br 117 40o L , J Klapperich 4 3 1938, Fukien [= Fujian], 0/1 in NMPC, **Guangdong** CH – Guangdong, Lechang env , 10 1 1994, 1/1 in DKCP, **Sichuan** Wo lung, 2000 m, Wassuland, 7 –10 1934, W Szechuan [= Sichuan], Sankiangkou, leg Friedrich, 4 spec in MHNG, W Sichuan, 14–15 VII 1994, 29 56N 101 58E, 3800–3000 m, 15 km S of Kangding, 5/6 in DKCP, China, Sichuan, 12 – 14 VII 1995, Baoxing env , cca 50 km NNW of Ya'an, 30°22'N 102°52'E, 3/3 in DKCP, China – NW Sichuan, mts 3–4000 m 70 km NNW Barkam, 22 7 1995, 1/0 in DKCP, **Yunnan** China N-Yunnan, 27°08'N 100°14'E, Yulongshan mts , 2900–3500 m, Baishui vill , 7–12/7 1990, 2/3 in DKCP, China N-Yunnan, 27°13'N 100°16'E, Yulongshan mts , 3200 m, E slope, 14 7 1990, 0/1 in DKCP, China N-Yunnan, 27°06'N 100°15'E, Yulongshan mts , 3000–3500 m, Ganhaizi pass, *18–23/7 1990*, 2/3 spec in DKCP, CH, Yunnan, *14–21 6 1993*, *100 km W of Baoshan*, Gaoligonshan Nat Res , 2/2 in DKCP, W Yunnan, 2200–2500 m, 24 57 N 98 45 E, 8 16/5 1995, Gaoligonshan mts , 0/1 in DKCP

DIAGNOSTIC CHARACTERS. Moderate in size (6.5–8.4 mm), strongly convex, almost oblong species Dorsal surface entirely bare, shining except for apex of elytron, black coloured, elytron yellowish red or red with darkened suture Abdominal sternites black Clypeal margin anteriorly broadly emarginate, anterior angle broadly rounded, side almost straight towards gena Gena regularly rounded, distinctly exceeding eye, not separated by sinuation from clypeal side Head in male with distinctly elevate, broadly arcuate clypeal carina and three frontal tubercles, medial tubercle more prominent, in female carina and tubercles less developed to subobsolete in small specimens, punctation fine and dense, surface near transverse carina wrinkled Pronotum anterior-

ly without medial fovea; anterior and posterior angles rounded; lateral and basal margin with marginal line; punctation of dorsal surface double, consisting of coarse, remarkably irregularly spaced punctures, mixed with very fine, nearly regularly spaced punctures separated approximately by 2–3 their diameter. Scutellum triangulate, with several punctures basally. Elytral humerus not denticulate; striae distinctly impressed, strial punctures regularly spaced, crenating only slightly interval margins; intervals nearly flat, finely and sparsely punctate. Sutural interval strongly angustate apically. Macropterous. Metasternal plate shallowly concave in male and flat in female, coarsely punctate, with complete longitudinal line. Ventromedial protibial edge with row of several irregularly spaced and irregularly sized denticles; terminal spur of protibia in both sexes reaching to apex of protarsomere 2. Apical margin of meso- and metatibia fimbriate with setae equal in length. Basimesotarsomere scarcely shorter than superior terminal spur of mesotibia. Basimetatarsomere longer than superior terminal spur of metatibia and approximately equal to next three tarsomeres combined. Aedeagus as in Figs 9, 10.

EPIPHARYNX (Fig. 1). Anterior margin with slightly developed lobes, anterolateral margin finely crenulate. Conical epitorma and pternotormae distinctly sclerotized, area of proplegmatium and apotormae slightly sclerotized. Epitorma anteriorly shortened, not reaching anterior margin. Helus laterally with group of microtrichiae and row of 7–10 setae, basally with row of sensillae. Corypha with 5–6 short, thick setae. Chaetoparia with one row of long setae. Chaetopedium covered with group of 18–21 thick setae and numerous remarkably long microtrichiae. Acroparia and acanthoparia covered with numerous thin, long setae. Apophoba and ipophoba covered with numerous thin setae, little shorter than in acroparia and acanthoparia. Nesium medially with one row of fine, short setae and laterally with group of fine, short setae.

DISTRIBUTION. China: Fujian, Sichuan (Balthasar 1964); first record from Guangdong and Yunnan.

Aphodius (*Aphodius*) *elegans* Allibert, 1847
(Figs 2, 11, 12)

Aphodius elegans Allibert, 1847: 18, fig. 1; Harold, 1863. 332; Miwa, 1931: 285

Aplodius (*Aphodius*) *elegans*: Schmidt, 1922: 272, 277, Boucomont, 1929: 784, Balthasar, 1932a: 98, 1932b: 117; 1964: 363–364, 370–371, fig. 137; Paulian, 1945: 170–171, Masumoto, 1977. 6, 1994: 371, pl. 66.32; Stebnicka, 1980: 238, fig. 69, Dellacasa, 1978. 1–6, figs 1, 2, 4, 7–11; 1988a: 124, 370; Masumoto & Kiuchi, 1987: 26–28, figs 1.1–2, 2.1–3, 3.1–4, pl. 1.1–6, Berlov, 1989: 399, Masumoto, Dellacasa & Kiuchi, 1990. 149–150; Zhang, 1992. 490

Aphodius bisignatus Dehaan, 1848: 136 (type locality: Japan, syn. by Dellacasa 1988a).

Aphodius (*Aphodius*) *elegans* var. *expletus* Schmidt, 1909. 20 (type locality: Yünnan; syn. by Balthasar 1964: 363, cited as "*Aphodius* (*Aphodius*) *elegans* ab. *expletus*")

Aphodius (*Aphodius*) *elegans expletus*: Schmidt, 1922: 277

Aphodius (*Aphodius*) *elegans* v. *plasoni* Kaufel, 1914: 142 (type locality: Mugden [= Shenyang; China: prov. Liaoning]; syn. by Balthasar 1964)

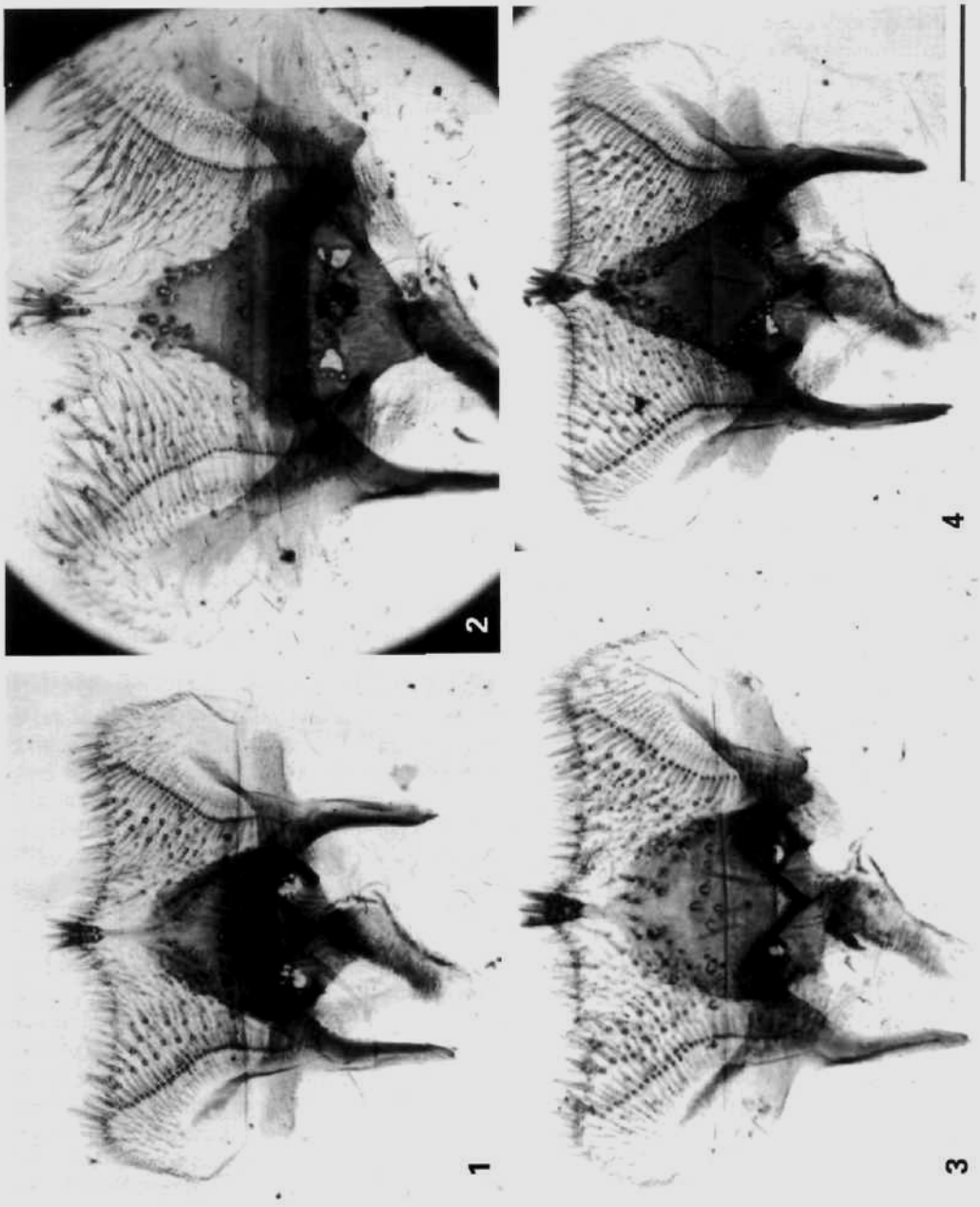
Aphodius (*Aphodius*) *plasoni*: Boucomont, 1929: 784; Dellacasa, 1978: 1–6, figs 3, 5, 6, 8–12, 1988a. 180, 370; Masumoto & Kiuchi, 1987: 26–28, figs 1.3, 2.4, 3.5, pl. 1.7–10; Berlov, 1989: 399, figs 226.4, 228.13.

TYPE LOCALITY. Chine [= China] (Allibert 1847).

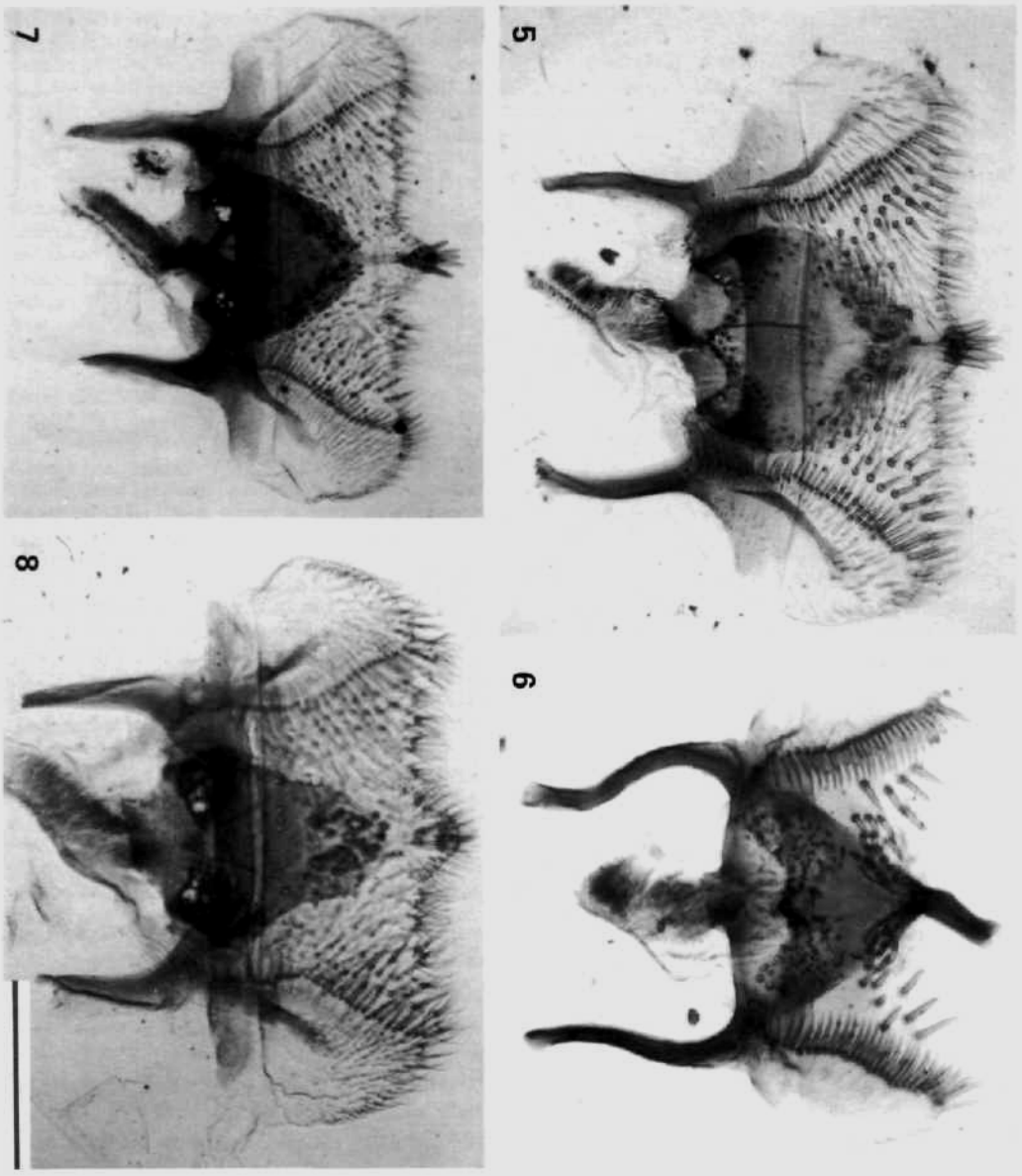
MATERIAL EXAMINED **China, Fujian**: Kwangtseh, Fukien [= Fujian], J. Klapperich, 11.10.1937, 1/0 in NMPC, Shaowu-Fukien [= Fujian], 500 m, Klapperich, 14.10.1937, 5 spec. in MHNG, 1/0 in NMPC; Shaowu-Fukien [= Fujian], 500 m, Klapperich, 20.10.1937, 4 spec. in MHNG, 1/1 in NMPC, Kuatun [= Huaqiao] (2300 m), 27, 40 n. Br., 11, 40 ö.L., J. Klapperich, 5.5.1938, Fukien [= Fujian], 2 spec. in HNHM, Fokien [= Fujian], 1 spec. in MNHN, **Gansu**: China, Gansu reg., Luqu, 2500 m, 11.7.1990, 2/0 in DKCP, China, Gansu reg., Dogcanglhamo, 4200 m, 12.–15.7.1990, 4/11 in DKCP, China, Gansu reg., Xiahe, 17.–18.7.1990, 1/1 in DKCP; **Guangdong**: CH – Guangdong, Lechang env., 10.1.1994, 1/1 in DKCP, Kanton [= Guangzhou], China mer., Ex coll. Heyrovský, 1/0 in NMPC, **Guizhou**: China – Guizhou, 21–26.5.1995, 60km N. Kaili, Shibing-Yuntai Shan, 1/1 in DKCP, **Hubei**: Hupe [= Hubei], Ichang [= Yichang], 3 spec. in ZMHB, China,

prov Hupeh [= Hubei], Mts Wu-Shan, 2 spec in ZMHB, **Jiangsu** Nanking [= Nanjing], Prov Kiangsu [= Jiangsu], China, 13 5 1934, H Hohe, 1 spec in ZMHB, **Jiangxi**: Kiang-Si [= Jiangxi], A David, 1 spec in MNHN, Pingshiang [= Pingxiang], Sud-China, Dr Kreyenberg, 1 spec in MHNG, **Qinghai** China, Qinghai reg , 2500 m, valley 40 km S of Huangyuan, 6 –8 7 1990, 3/1 in DKCP, Ch – S Qinghai, 13/7 1995, 33 08N 97 20E, 3400 m, Xiwu, S outskirts left trib Jinsha riv , 4/2 in DKCP, Thibet, Kuku-Nor [= Qinghai lake], 3200 m, F Hauser, 1898, 2 spec in HNHM, 4 spec in MHNG, Kuku Noor [= Qinghai lake], Koltze, 4 spec in DEIC, Tibet bor , Kuku-noor [= Qinghai lake], 1 spec in HNHM, **Shandong** Kiautschau [= Qing Dao], China, 4 spec in HNHM, 2 spec in MHNG, **Shanghai Shi** S'ghai' [= Sahnghai], P de Borre, coll St Barton, Ach 3 1899, 1 spec in MHNG, Shanghai (China), Province Kiangsu [= Jiangsu], 20 5 1936, H Hohe, 2 spec in ZMHB, **Sichuan** China, pr Sichuan, Emei mt , 1000 m, 4 –20 5 1989, 7/8 in DKCP, China, W Sichuan, Dege – S env , 3100–4300 m, 31°39' / 98°37', 4 –9 6 1992, 1/1 in DKCP, W Sichuan, 3 –6 VII 1994, 29 35N 102 00E, 2900–3200 m, Gonggashan mts , Haituogou vall , 1/0 in DKCP, W Sichuan, 9–11 VII 1994, 29 53N 102 01E, cca 4000 m, Gonggashan mts NNE sl , 15/23 in DKCP, W Sichuan, 12–14 VII 1994, 29 55N 102 02E, 4200–4900 m, Paumashan mts , 5/10 in DKCP, W Sichuan, 14–15 VII 1994, 29 56N 101 58E, 3800–3000 m, 15 km S of Kangding, 10/10, China (Sichuan), Umg Kangding 3000–3100 m, 21/22 VII 1994, 5/10 in DKCP, China (Sichuan), n Kangding See Mu-ge-cuo, 3500–3900 m, 22 VII 1994, 1/0 in DKCP, China, NW Sichuan, road Zogqen – Qagca, 60 km NW Zogqên, 4000 m, 19 6 1995, 1/0 in JRCP, Ch – NW Sichuan, 24/7 1995, 28 07N 101 05E, 30 km NW Muli/Bowa, mixed forest, ca 3500 m, 1/2 in DKCP, China, Sichuan prov , Litang env , 5000 m, 29 7 –3 8 1995, 0/1 in DKCP, Ta-Tsien-Lou [= Kangding], Chasseurs indigenes 1893, 1 spec in MNHN, Su-Tchuen [= Sichuan], Chasseurs Indigènes, 1903, 2 spec in MNHN, Tatsienlu [= Kangding], Grenze Thibet Ost, Em Reitter, 3/0 in RMOC, Tatsienlu [= Kangding] – Kiulung, China, Em Reitter,1 spec in ZMHB, 3 spec in MHNG, Tatsienlu [= Kangding] – Tsndse, Szechuan [= Sichuan], China, Bergweiden, Em Reitter, 1/0 in NMPC, Tatsienlu [= Kangding] Yunling , Sud Szechuan [= Sichuan], China, 9/4 in NMPC, 1 spec in ZMHB, 1 spec in MHNG, Thibet, Tatsienlou [= Kangding], Mgr F Biet, 1 spec in MNHN, **Xinjiang** Nordwestl China, Chinkiang [= Xinjiang], coll Reitter, 4 spec in MHNG, **Yunnan** China N-Yunnan, 27°08'N 100°14'E, Yulongshan mts , 2900–3500 m, Baishui vill , 7–12/7 1990, 15/20 in DKCP, China N-Yunnan, 27°13'N 100°16'E, Yulongshan mts , 3200 m, E slope, 14 7 1990, 23/14 in DKCP, China N Yunnan, 27°06'N 100°15'E, Yulongshan mts , 3000–3500 m, Ganhaizi pass, 18 23/7 1990, 30/21 in DKCP, Yunnan, 2000–2500 m, 25 42N 100 08E, Cangshan mts , E slope, 21/6 1992, 0/1 in DKCP, Yunnan, 2800–3000 m, 25 12N 100 24E, Weibaoshan mts , 29–30/6 1992, 0/2 in DKCP, Yunnan, 3300–2500 m, 27 14N 100 15E, Yulongshan mts , N slope, 5/7 1992, 2/3 in DKCP, Yunnan, 2000–3000 m, 27 20N 100 11E, Habashan mts , SE slope, 10–13/7 1992, 4/0 in DKCP, Yunnan, 3000–3800 m, 27 20N 100 09E, Habashan mts , E slope, 13–17/7 1992, 2/1 in DKCP, Yunnan, 24–26 May 1993, Yulong mts , 27 01N 100 12E, 3200 m, 1/4 in DKCP, CH, Yunnan, 14 –21 6 1993, 100km W of Baoshan, Gaoligonshan Nat Res , 0/1 in DKCP, N Yunnan, 19–25 VI 1994, 27 49N 99 43E, cca 3600 m, Zhongdian, 10/15 in DKCP, N Yunnan, 22–24 VI 1994, 27 49N 99 34E, 3800–4200 m, mts 15 km of Zhongdian, 15/20 in DKCP, N Yunnan, 23 VI 1994, 27 49N 99 34E, 4200–4700 m, mts 15 km W of Zhongdian, 0/2 in DKCP, W Yunnan, 2200–2500 m, 24 57N 98 45E, 8–16/5 1995, Gaoligonshan mts, 1/1 in DKCP, Yunnan, P Guerry Roaune, 2 spec in MHNG, Yunnan, R P Delavay, 1 spec in MNHN, **Zhejiang** Ningpo [= Ningbo], P de Borre, coll St Barton, Ach 3 1899, 1 spec in MHNG, China Zhejiang prov , Anji County, ca 450 m, Long Wang Shan N R , 14 V 1996, Mercury vapour light, 0/1 in DKCP, China, Ning P [= Ningbo], 1 spec in ZMHB, China, Tsche-kiang [= Zhejiang], 1 spec in ZMHB Sé Pin, Chasseurs indigenes, Ete 1892, 3 spec in MNHN, Chasseurs Thibetains, 1899, 4 spec in MNHN, Tien-tai-Shan, 20 4 35, H Hohe, 7 spec in ZMHB, China, Junai , 3 spec in ZMHB **Japan** Nagasaki 1873, 1 spec in ZMHB, Jap , IV 1954, Sakata, 1/2 in NMPC, Iwate, Japan, 1 spec in ZMHB, Jap Kobe, C Gotsche, 1 spec in ZMHB, Japan, 3 spec in ZMHB, Japonia, 5 spec in MNHN, Japan, Osaka, 1 spec in NMPC **Vietnam** Vietnam b , Sa Pa env , Fan Si Pan mts , 20–25 I 1994, L + R Businsky lgt , 9 spec in DKCP, N Viet nam, Mt Fan-si-pan, N-Sette, Cha-pa (= Sapa), 22 17N 103 44E prim Urwald, 28 x –3 xi 1994, leg Sinjaev & emh Sammler, 0/1 in DKCP

DIAGNOSTIC CHARACTERS Large in size (9 3–14.1 mm), strongly convex, oblong species Dorsal surface entirely bare, shining, black coloured, elytron yellow to yellowish red with black transversal band situated in posterior half of elytral length, in some specimens all posterior half of elytron black, and with darkened suture Abdominal sternites black Clypeal margin anteriorly broadly, shallowly emarginate, anterior angle broadly rounded, side broadly rounded towards gena Gena regularly rounded, distinctly exceeding eye, distinctly separated by sinuation and genal suture from clypeal side Head anteromedially in male with considerably long, slightly arcuate posteriorly, apically pointed clypeal horn; lateral frontal tubercles very slightly developed, medial tubercle missing at all; in female clypeus medially eleveted, lateral tubercles subobsolete, medial obsolete, punctation fine, simple and regular Pronotum in male anteriorly with shallow fovea, or with flat area in small specimens, anterior angle rounded, anterolateral mar-



Figs 1–4. Epipharynx. *Aphodius* (*Aphodius*) *calichromus* Balthasar (Sichuan, Baoxing) (1), *A.* (*A.*) *elegans* Allibert (Sichuan, 15 km S of Kangding) (2), *A.* (*A.*) *fasciger* Harold (Vietnam, Fan Si Pan) (3), *A.* (*A.*) *fimetarius* (Linnaeus) (Irkutsk, Listvjanka) (4). Scale – 0.3 mm.



Figs 5–8. Epipharynx. *Aphodius* (*Aphodius*) *foetens* (Fabricius) (Xinjiang, Sayram lake) (5), *A.* (*A.*) *frater* Mulsant et Rey (Xinjiang, Tianchi) (6), *A.* (*A.*) *irregularis* Westwood in Royle (Xizang, Brahmaputra great bend) (7), *A.* (*A.*) *reginae* sp. n. (PT No 12) (8). Scale – 0.3 mm.

gin in dorsal aspect broadly rounded, posterior angle truncate, lateral and basal margins with marginal line; punctation of dorsal surface in female double, consisting of coarse, distinctly irregularly distributed punctures mixed with very fine almost regularly distributed punctures, in male punctation present only laterally, remainig surface smooth. Scutellum triangulate, with several fine punctures basally. Elytral humerus not denticulate; striae narrow, distinctly impressed, strial punctures regularly spaced, not crenating interval margins; intervals almost flat, very finely and sparsely punctate, sutural interval strongly angustate apically. Macropterous. Metasternal plate in male distinctly concave, in female slmost flat, impunctate, with indicated longitudinal line. Ventromedial protibial edge with row of several irregularly spaced and irregularly sized denticles; terminal spur of protibia in male variously shaped: from slender, curved and apically pointed to almost lanceolate; in female straight and pointed apically. Apical margin of meso- and metatibia fimbriate with setae of equal length. Basimesotarsomere distinctly longer than superior terminal spur of mesotibia. Basimetatarsomere distinctly longer than superior terminal spur of metatibia and approximately equal to next three tarsomeres combined. Aedeagus as in Figs 11, 12.

Epipharynx (Fig. 2). Anterior margin with distinct setaceous lobes. Conical epitorma and pternotormae distinctly sclerotized, area of proplegmatium and apotormae sclerotized. Epitorma anteriorly shortened. Helus anteriorly with group of 15–20 short, thick setae, basally with row of sensillae. Corypha with 4–5 short, thick setae. Chaetoparia with one row of long setae. Chaetopedium covered with group of 28–35 thick setae and numerous remarkably long microtrichiae. Acanthoparia and lobes of acroparia covered with numerous thin, long setae, each lobe bearing 4–10 of such setae. Apophoba and ipophoba covered with numerous thin setae little shorter than in acroparia and acanthoparia. Nesium with group of sensillae medially, and group of fine, short setae laterally.

Distribution. China: Anhui, Fujian, Guangdong, Guizhou, Henan, Hubei, Jiangsu, Liaoning, Shandong, Shanghai Shi, Sichuan, Taiwan, Xizang, Yunnan and Zhejiang (Balthasar 1964, Boucomont 1929, Dellacasa 1978, Masumoto 1977, Miwa 1931, Schmidt 1922, Zhang 1992), first record from Gansu, Jiangxi, Qinghai and Xinjiang; Russian Far East (Berlov 1989); N Korea (Stebnicka 1980); Japan: Hokkaido, Honshu, Sado, Shikoku, Kyushu, Takarajima, Amami Ôshima, Okinawa and Miyake (e. g. Stebnicka 1980); N Vietnam (Balthasar 1964); Laos (Masumoto & Kiuchi (1987) and "Indochina" (Paulian 1945, Stebnicka 1980); record from India by Miwa (1931) is improbable.

Discussion. *Aphodius plasoni* was described as a variety of *A. elegans* by Käufel (1914), in Schmidt's monography (1922) it is omitted. Later, in 1964, the taxon was synonymized with *A. (A.) elegans* by Balthasar. But Dellacasa (1978) considered *A. plasoni* as a good species based mainly on the following diagnostic characters: gena not distinctly separated from clypeal side by sinuation, scutellum apically with two longitudinal triangulate impressions, elytral striae distinctly impressed and coarsely crenulate, elytral intervals convex with almost indistinct punctation, basimetatarsomere cylindrical, different shape of parameres and shape and setation of epipharyngeal structures. Masumoto & Kiuchi (1987) evaluated these characters based on relatively more numerous material as intermediate between them or those having characteristics of both the forms. I have studied more than 400 specimens mainly from west and southeast part of the distribution area (see material examined) and in my opinion the two forms should be thought to be extreme representatives of the variations within one species, *A. (A.) elegans*, in agreement with Masumoto & Kiuchi (1987).

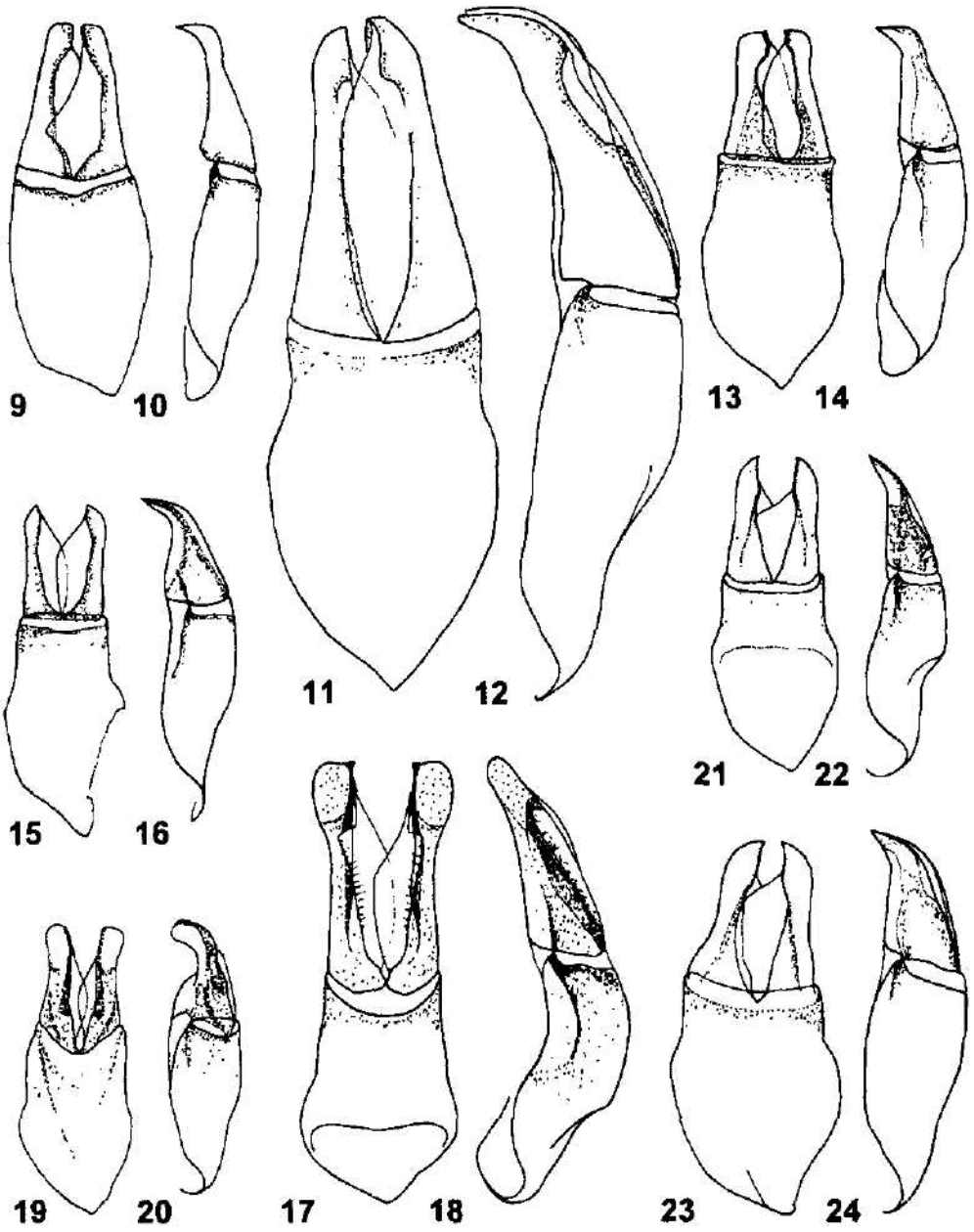
Aphodius (*Aphodius*) *fasciger* Harold, 1881
(Figs 3, 13, 14)

Aphodius fasciger Harold, 1881 89
Aphodius (*Aphodius*) *fasciger* Schmidt, 1922 272, 277–288, Paulian, 1936 64, fig 1a–f, 1945 170–171, fig 80, Balthasar, 1932b 117, 1964 364, 372–373, fig 139, Petrovitz, 1975 220, Stebnicka, 1981 325, 1986 18–19, 1989 5, 1990 4, Dellacasa, 1988a 128, 370, Zhang, 1992 490, Ahrens & Stebnicka, 1997 14
Aphodius (*Aphodius*) *schenklingi* Schmidt, 1907 202 (type locality Sikkim, syn by Balthasar, 1964 372, cited as "*Aphodius* (*Aphodius*) *fasciger* ab *schenklingi*")
Aphodius (*Aphodius*) *fasciger* var *schenklingi* Schmidt, 1913 161
Aphodius (*Aphodius*) *fasciger schenklingi* Schmidt, 1922 277
Aphodius (*Aphodius*) *fasciger* var *infestus* Schmidt, 1907 570, 1913 162 (type locality Assam, syn by Balthasar, 1964 372, cited as "*Aphodius* (*Aphodius*) *fasciger* ab *infestus*")
Aphodius (*Aphodius*) *fasciger infestus* Schmidt, 1922 277
Aphodius (*Aphodius*) *fasciger* var *sexsignatus* Schmidt, 1907 570), 1913 162 (type locality Sikkim, syn by Balthasar, 1964 372, cited as "*Aphodius* (*Aphodius*) *fasciger* ab *sexsignatus*")
Aphodius (*Aphodius*) *fasciger sexsignatus* Schmidt, 1922 278

TYPE LOCALITY Darjeeling [India West Bengal prov.] (Harold 1881)

MATERIAL EXAMINED **China, Guizhou** 21.-26/5 1995, 60 km N Kaili, Shibing-Yuntai Shan, 1 spec in DKCP, **Shandong** Kiautschau [= Qing Dao], China, 1 spec in MHNG, **Sichuan** Kiufushan, Prov Szechuan [= Sichuan], coll. H. Becher, West China, IV. 1 spec in MHNG, Tatsienlu [= Kangding] Tsendse, China, Szechuan [= Sichuan], Reitter, 1 spec in MHNG, 2 spec in NMPC, Tatsienlu [= Kangding], Yuling Sud, Szechuan [= Sichuan], China, 2 spec in NMPC, **Xizang** China, E-Tibet, 2050–2400 m, N of Brahmaputra great bend, 30°00'–07'/ 94°52'–95°09', 16.–20.7.1992, 1/0 in DKCP, **Yunnan** Yunnan, Okr. Tsinpina [= env. Tsinpin], 1700 m, 13.V.1956, Khuan Ke-zhen [lgt.] 1 dr. [and the other] [orig. in Cyrillic script], 4 spec in ZMAS, Yunnan, 1800–2500 m, 25.10N 100.21E, Weishan mt., 22–25/6 1992, 2/2 in DKCP, CH. Yunnan, 14–21.6.1993, 100km W of Baoshan, Gaoligonshan Nat. Res., 2/3 in DKCP, W. Yunnan, 2200–2500 m, 24.57N 98.45E, 8.-16/5 1995, Gaoligonshan mts., 1 spec in DKPC, China, Yunnan, Gbg. bei Mengtze [= Weizhou], 1 spec in MHNG, Yunnan, R. P. Delavay, 1 spec in MNHN **India, West Bengal** Environs de Kurseong / R. P. Bretaudeau, 1 spec in MNHN **Nepal** E. Nepal. Kosi, env. Num, 23.IV.1984, 1800–2000 m, Smetana – Lobl [lgt.], 0/1 in DKCP, E. Nepal, 28.4.1988, Hille, S. Bily leg., 2/3 in DKCP **Sikkim** Inde Anglaise, Pedong, Region de Darjeeling, Chasseurs indigènes 1935, 14 spec in MNHN, Pedong bei Darjeeling, 1935, 1 spec in NMPC, Himalaya, Sikkim, 3 spec in ZMHB, Sikkim, Pedong, VI 1962, 1 spec in DKCP **Vietnam** Vietnam b., 27.5.–2.6.1986, prov. Vinh Phu, Tam Dao, 900 m, Pavel Marhoul lgt., 4/6 in DKCP, Vietnam b., Sa Pa env., Fan Si Pan mts., 20–25.1.1994, L.+R. Businsky lgt., 9 spec. in DKCP

DIAGNOSTIC CHARACTERS Relatively small in size (5.5–7.0), strongly convex, almost oblong species. Dorsal surface entirely bare, shining except for apex of elytron, black coloured, anterior pronotal angle with yellow, reddish yellow or red band, elytron yellow, reddish yellow or red with black transversal spot situated posteriorly of middle of elytral length, in some specimens also with black humeral spot, and/or with whole posterior half of elytron black. Abdominal sternites black. Clypeal margin anteriorly broadly emarginate, anterior angle broadly rounded, side almost straight to gena. Gena regularly rounded, distinctly exceeding eye, separated from clypeal side by shallow sinuation. Head in male with short, arcuate clypeal carina and three frontal tubercles, medial tubercle more prominent, in female carina and tubercles less developed to subobsolete in small specimens, punctation fine and dense. Pronotum anteriorly without medial fovea, anterior angle rounded, posterior angle truncate, not emarginate, lateral and basal margin with marginal line, punctation of dorsal surface double, consisting of coarse, remarkably irregularly and sparsely distributed punctures becoming denser laterally, mixed with very fine, nearly regularly spaced punctures separated approximately by 2–3 their diameter. Scutellum triangulate, with several punctures basally. Elytral humerus not denticulate, striae distinctly impressed, strial punctures regularly spaced, crenating slightly interval margins, intervals nearly flat, finely and sparsely punctate, sutural interval strongly angustate apically. Macropterous. Metasternal plate shallowly concave in male and nearly flat in female, punctate, with com-



Figs 9–24. Aedeagus: odd numerals – dorsal aspect, even numerals – lateral aspect. *Aphodius* (*Aphodius*) *calichromus* Balthasar (Sichuan, Barkam) (9, 10), *A.* (*A.*) *elegans* Allibert (Gansu, Luqu) (11, 12), *A.* (*A.*) *fasciger* Harold (Xizang, Brahmaputra great bend) (13, 14), *A.* (*A.*) *fimetarius* (Linnaeus) (Nepal, Langtang) (15, 16), *A.* (*A.*) *foetens* (Fabricius) (Bohemia, Poplze) (17, 18), *A.* (*A.*) *frater* Mulsant et Rey (Xinjiang, Tianchi) (19, 20), *A.* (*A.*) *irregularis* Westwood in Royle (Nepal, Kathmandu) (21, 22), *A.* (*A.*) *reginae* sp. n. (HT) (23–24).

plete longitudinal line. Ventromedial protibial edge with row of several irregularly spaced and irregularly sized denticles; terminal spur of protibia in male stout, apically bent somewhat anterolaterally and pointed, reaching to apical margin of protarsomere 2; in female slender, a little shorter, simply pointed. Apical margin of meso- and metatibia fimbriate with setae equal in length. Basimesotarsomere longer than superior terminal spur of mesotibia. Basimetatarsomere longer than superior terminal spur of metatibia and approximately equal to next three tarsomeres combined. Aedeagus as in Figs 13, 14.

EPIPHARYNX (Fig 3). Anterior margin with slightly but distinctly developed lobes. Conical epitorma and pternotormae distinctly sclerotized. Epitorma anteriorly shortened, not reaching to anterior margin. Helus anterolaterally with group of 6–8 robust setae, basally with several irregularly spaced sensillae. Corypha with 4–5 short, thick setae. Chaetoparia with one row of long setae. Chaetopedium covered with group of 22–27 thick setae and numerous long microtrichiae. Acroparia and acanthoparia covered with numerous thin, long setae. Apophoba and ipophoba covered with numerous thin setae, little shorter than in acroparia and acanthoparia. Nesium medially with V-shaped row of dense short, spinlike setae and group of several short, spinlike setae laterally.

DISTRIBUTION. China: Sichuan, Xizang, Yunnan (Paulian 1936, Zhang 1992), first record from Guizhou and Shandong; Himalayas: Nepal, India (West Bengal, Assam), Sikkim, Bhutan, (Ahrens & Stebnicka 1997; Balthasar 1964; Paulian 1936; Schmidt 1922; Stebnicka 1981, 1986); Vietnam (Annam, Tonkin) (Balthasar 1964, Paulian 1945).

Aphodius (Aphodius) fimetarius (Linnaeus, 1758)
(Figs 4, 15, 16)

Scarabaeus fimetarius Linnaeus, 1758: 348.
Aphodius (Aphodius) fimetarius Boucomont, 1929: 783; Schmidt, 1922: 271–273; Balthasar, 1964: 363–365; Stebnicka, 1986: 18–19, 1989; Nikolaev, 1987: 102, 122; 5, 11–12, Dellacasa, 1988a: 129, 370, Berlov, 1989: 399, fig. 226: 8, Zhang, 1992: 490, Ahrens & Stebnicka, 1997: 14–15.

TYPE LOCALITY. Europe (Linnaeus 1758).

MATERIAL EXAMINED. **China, Xinjiang:** China, Xinjiang, 2000–2500 m, NE slope of Tian Shan Mt., road Urumqi – Houxia, 15.–17/V 1993, ca 60 km SW Urumqi, 0/1 in DKCP; China, Xinjiang, 1500–2000 m, NW slope of Bogda Shan, 115 km E Urumqi, 18–19/V 1993, 10 km N Tianchi, 0/1 in DKCP. China, Kychang, 13.–24.8.1903, coll. Hauser, 2 spec. in ZMHB, 1 spec. in DKCP. **Nepal:** Nepal, 13.5.1988, Langtang Nat. P., Ghora Tabela, 3000 m, S. Bílý lgt., 1/1 in DKCP. **Russia, Irkutsk region:** USSR – Irkutsk, Listvjanka, 28.6.1977, L. Hlaváčková lgt., 2/0 in DKCP.

DIAGNOSTIC CHARACTERS. Moderate in size (5.5–8.4 mm), strongly convex almost oblong species. Dorsal surface entirely bare, shining; black coloured; anterior pronotal angle and elytron red or dark red, elytral suture darkened. Abdominal sternites black. Clypeal margin anteriorly only shallowly emarginate, anterior angle broadly rounded, side rounded towards gena. Gena subtruncate, not exceeding eye laterally, separated from clypeal side by sinuation. Head in male with distinctly elevate, broadly arcuate clypeal carina and three frontal tubercles, medial tubercle more prominent; in female carina and tubercles less developed to obsolete in small specimens; punctation fine and dense, surface anteriorly of clypeal carina rather rugopunctate in male. Pronotum in male anteriorly with shallow fovea; anterior angle rounded, posterior truncate, very weakly emarginate; lateral and basal margin with marginal line; punctation of dorsal surface double, consisting of coarse, remarkably irregularly and sparsely spaced punctures, mixed with very fine, nearly regularly spaced punctures separated approximately by 2–3 their diameter. Scutellum triangulate, with several coarse punctures. Elytral humerus not denticulate, striae

distinctly impressed, relatively broad, strial punctures regularly distributed, crenating distinctly interval margins; intervals nearly flat, finely and sparsely punctate; sutural interval strongly angustate apically. Macropterous. Metasternal plate in male concave, in female only shallowly; coarsely, regularly punctate, with complete longitudinal line. Ventromedial protibial edge with row of several irregularly spaced and irregularly sized denticles; terminal spur of protibia in male reaching to apex of protarsomere 2, in female a little shorter. Apical margin of meso- and metatibia fimbriate with setae equal in length. Basimesotarsomere shorter than superior terminal spur of mesotibia. Basimetatarsomere longer than superior terminal spur of metatibia and approximately equal to next three tarsomeres combined. Aedeagus as in Figs 15, 16.

EPIPHARYNX (Fig. 4). Anterior margin smooth. Conical epitorma, pternotormae, area of propleg-matium and apotormae sclerotized. Epitorma anteriorly not shortened. Helus anteriorly with group of 12–15 thick setae; basally with several sensillae. Corypha with 4–6 short, thick setae. Chaetoparia with one row of long setae. Chaetopedium covered with group of 14–17 thick setae and numerous long microtrichiae. Acroparia and acanthoparia covered with numerous thin, long setae. Apophoba and ipophoba covered with numerous thin setae, little shorter than in acroparia and acanthoparia. Nesium with V-shaped row of sensillae and lateral groups of short, spinlike setae.

DISTRIBUTION. China: Sichuan, Xinjiang, Xizang (Zhang 1992). Distributed thgroughout western Palaearctics, eastward to Transbaikalia and Yakutia (Berlov 1989), known also from the Himalayas (from Kashmir to Nepal) (Ahrens & Stebnicka 1997; Schmidt 1922; Stebnicka 1986, 1989), introduced to Canada, the United States (e. g. Ratcliffe 1991) and to Australia (e. g. Stebnicka & Howden 1995).

Aphodius (*Aphodius*) *foetens* (Fabricius, 1787)
(Figs 5, 17, 18)

Scarabaeus foetens Fabricius, 1787: 8
Aphodius (*Aphodius*) *foetens* Nikolaev, 1987: 102, 122; Dellacasa, 1988a: 130, 370, Berlov, 1989: 399, fig. 226.9.
Aphodius aestivalis Stephens, 1839: 160; Schmidt, 1922: 271, 273; Balthasar, 1964: 363, 365.

TYPE LOCALITY. Halae Saxonum [= Halle, Sachsen; Germany] (Fabricius 1787).

MATERIAL EXAMINED. China, Xinjiang, W Borohoro Shan, Sayram lake, 28 VII.1993, 0/1 in DKCP

DIAGNOSTIC CHARACTERS. Moderate in size (6.2–8.0), moderately convex, almost oblong species. Dorsal surface entirely bare, shining; black coloured; anterior angle of pronotum and elytron red or dark red with darkened suture. Extremities and abdominal sternites reddish or red. Clypeal margin anteriorly with shallow, broad emargination, anterior angle broadly rounded, side almost straight towards gena. Gena regularly rounded, slightly exceeding eye, very slightly separated from clypeal side by shallow sinuation. Head in male with broadly arcuate clypeal carina and three frontal tubercles, medial tubercle more prominent, lateral tubercles subobsolete; in female carina and tubercles less developed, in small specimens carina missing at all; punctation coarse and dense, surface near transverse carina wrinkled. Pronotum without anterior fovea, only in large males with small flat area medially near anterior margin; anterior angles rounded, anterolateral margin in dorsal aspect straight, posterior angles truncate and shallowly emarginate; lateral and basal margin with marginal line; punctation of dorsal surface double, consisting of coarse, very rarely distributed punctures (in male disc nearly impunctate) and very fine and sparse punctures distributed only laterally and basally. Scutellum triangulate, with several coarse punctures. Elytral humerus not denticulate; striae relatively very broad, strial punctures regular-

ly spaced, distinctly crenating interval margins; intervals nearly flat, fine and sparsely punctate; sutural interval strongly angustate apically. Macropterous. Metasternal plate shallowly concave in male and nearly flat in female; only anteriorly finely punctate, with complete longitudinal line. Ventromedial protibial edge with row of several almost regularly distributed and regularly sized, fine denticles; terminal spur of protibia reaching in both sexes approximately two thirds of protarsomere 2. Apical margin of meso- and metatibia fimbriate with setae equal in length. Basimesotarsomere distinctly shorter than superior terminal spur of mesotibia. Basimetatarsomere scarcely shorter than superior terminal spur of metatibia and approximately equal to next three tarsomeres combined. Aedeagus as in Figs 17, 18.

EPIPHARYNX (Fig. 5). Anterior margin with slightly developed lobes. Conical epitorma and pternotormae distinctly sclerotized. Epitorma anteriorly not shortened. Area of proplegmatium and apotormae sclerotized. Helus anterolaterally with group of 10–13 robust setae, basally with row of several sensillae. Corypha with 5–6 short, thick setae. Chaetoparia with one row of long setae. Chaetopedium covered with group of 20–21 thick setae and numerous long microtrichiae. Acroparia and acanthoparia covered with numerous thin, long setae. Apophoba and ipophoba covered with numerous thin setae little shorter than in acroparia and acanthoparia. Nesium medially with V-shaped row of sensillae and group of fine, short setae laterally.

DISTRIBUTION. First record from China (Xinjiang); widespread species in temperate zone of Euroasia, in the east reaching Transbaikalia and Yakutia (Berlov 1989).

Aphodius (*Aphodius*) *frater* Mulsant et Rey, 1870
(Figs 6, 19, 20)

Aphodius (*Loraspis*) *frater* Mulsant et Rey, 1870: 203; Nikolaev, 1987. 98, 122; Dellacasa, 1988a: 131, 382; Veiga, 1988: 85–88

Aphodius sulcatus Illiger, 1804: 152, non *Scarabaeus sulcatus* Fabricius, 1792: 24 [= *Aphodius subterraneus* (Linnaeus, 1758) (Landin 1956)].

Aphodius (*Aphodius*) *sulcatus* Schmidt, 1922: 271, 276; Balthasar, 1964: 363, 368–369, fig. 136, non *Scarabaeus sulcatus* Fabricius, 1792. 24 [= *Aphodius subterraneus* (Linnaeus, 1758) (Landin 1956)]

TYPE LOCALITY. Batoum [= Batumi; Georgia] (Mulsant & Rey 1870).

MATERIAL EXAMINED. **China, Xinjiang** China, Xinjiang, 1500–2000 m, NW slope of Bogda Shan, 115 km E Urumqi, 18–19/5 1993, 10 km N Tianchi, 12/17 in DKCP **Kazakhstan** N Kasachstan, Korgasyn, 3.VI 1970, 0/1 in DKCP. **Kyrgyzstan** Turkestan, Env de Narin, 1909, 7 spec in MNHN. **Russia, Bashkiria** Bashkiria, Sterlitamon, 31 V 1935, 0/1 in DKCP

DIAGNOSTIC CHARACTERS. Moderate in size (5.2–7.0), strongly convex, almost oblong species. Dorsal surface entirely bare, shining; black coloured including abdominal sternites. Clypeal margin anteriorly broadly emarginate, anterior angle broadly rounded, side almost straight towards gena. Gena regularly rounded, distinctly exceeding eye, not separated by sinuation from clypeal side. Head in male with distinctly elevate, broadly arcuate clypeal carina and three frontal tubercles, medial tubercle more prominent; in female tubercles subobsolete to missing at all in small specimens; punctation coarse and dense, anteriorly of clypeal carina rather rugopunctate. Pronotum anteriorly with shallow medial fovea; anterior angle rounded, anterolateral margin in dorsal aspect straight, posterior angle truncate without emargination; pronotum all around with marginal line; punctation of dorsal surface double, consisting of coarse irregularly distributed punctures mixed with fine also irregularly distributed punctures separated by 2–4 their diameter; in male coarse punctation remarkably more sparse, mainly on disc. Scutellum triangulate, impunctate. Elytral humerus not denticulate; striae distinctly impressed, strial punctures regularly spaced, crenating slightly interval margins; intervals weakly convex, finely and sparsely

punctate, sutural interval only very slightly angustate apically Macropterous Metasternal plate in male concave, in female only very shallowly, sparsely and finely punctate, without longitudinal line Ventromedial protibial edge with row of several regularly spaced and regularly sized denticles, terminal spur of protibia reaching in both sexes to approximately half of protarsomere 2 Apical margin of meso- and metatibia fimbriate with setae equal in length Basimesotarsomere distinctly shorter than superior terminal spur of mesotibia Basimetatarsomere distinctly shorter than superior terminal spur of metatibia and approximately equal to next three tarsomeres combined Aedeagus as in Figs 19, 20

EPIPHARYNX (Fig 6) Anterior and anterolateral margin without lobes Conical epitorma and pternotormae strongly sclerotized, apotormae sclerotized, remaining surface except for anterior and lateral margin also weakly sclerotized Epitorma not shortened anteriorly prolonged in long, curved, strongly sclerotized zygum Helus anterolaterally with group of 6–7 short, robust setae basally with several sensillae Chaetoparia with one row of long, robust setae Chaetopedium only anteriorly covered with group of 11–13 robust setae and numerous remarkably long microtrichiae Acroparia and acanthoparia covered with sparsely distributed long, remarkably thin setae Apophoba and ipohoba with very sparsely distributed thin setae little shorter than in acroparia and acanthoparia Nesium medially with V-shaped row of sensillae confluent with lateral groups of sensillae and short, fine setae

DISTRIBUTION First record from China (Xinjiang), widely distributed in Euroasia, from Spain to Kazakhstan and western part of Siberia (Nikolaev 1987, Veiga 1988)

Aphodius (*Aphodius*) *irregularis* Westwood in Royle, 1839
(Figs 7, 21, 22)

Aphodius irregularis Westwood in Royle, 1839 55, Harold, 1863 332, 345
Aphodius (*Aphodius*) *irregularis* Schmidt 1922 272, 278, Balthasar, 1932b 117, 1964 364, 373, fig 140, 1965 110, Balthasar & Chujo, 1966 543 Stebnicka, 1881 325, 1986 18 19, 1989 5, 1990 4, Dellacasa, 1988a 146, 370, Ahrens & Stebnicka 1997 15
Aphodius (*Agrilinus*) *krupkai* Tesař, 1969 62 63 (type locality Rawalpindi, West Pakistan, syn by Stebnicka 1989)

TYPE LOCALITY Himalaya (Westwood in Royle 1839)

MATERIAL EXAMINED **China, Xizang** China, E Tibet, 2050–2400 m, N of Brahmaputra great bend, 30°00'–07'/ 94°52'–95°09', 16 20 7 1992 1/0 in DKCP **India, Himachal Pradesh** Manali, Kulu, 5 spec in MHNG, 1 spec in NMPC, **Jammu and Kashmir** Kashmir, 1 spec in ZMHB, **Uttar Pradesh** Airadeo, Almora N P, J C M Gardener, 18 VI 1937, 2 spec in NMPC N-Indien Uttar Pradesh, 2300 m, 10 km W Mussorie, 17 Aug 1985, leg J Schulze, 1 spec in ZMHB, **West Bengal** Darjeel (Museum Paris, 1906) Collection Leon Fairmaire, 1 spec in MNHN **Nepal** Nepal, Kathamandu, 16 IV 1962, 1400 m, leg Ebert, 2 spec in NMPC Nepal, Ting-Sang La, 3800 m, 6/7 V 1962, leg G Ebert, 1 spec in NMPC, Nepal, Mt Everest, 11 1996 leg Podrabska, 1/1 in DKCP **Pakistan** West Pakistan, Rawalpindi, 24 X 1955, Chr Lindemann leg, 1/3 in NMPC **Sikkim** Inde Anglaise, Pedong, Region de Darjeeling, Chasseurs indigenes 1935 8 spec in MNHN

DIAGNOSTIC CHARACTERS Moderate in size (5 5–6 2 mm), strongly convex, almost oblong species Dorsal surface entirely bare, shining except of apex of elytron, black coloured, anterior pronotal angle and elytron yellowish or yellowish red with black transversal spot situated at middle of elytral length and with black humeral and apical spot, and darkened suture Abdominal sternites black Clypeal margin anteriorly broadly emarginate, anterior angle broadly rounded, side broadly rounded towards gena Gena regularly rounded, distinctly exceeding eye, not separated by sinuation from clypeal side Head in male with distinctly elevate, broadly arcuate clypeal carina and three frontal tubercles, medial tubercle more prominent, in female carina and tubercles less developed, punctation coarse and dense, area near clypeal carina wrinkled Pronotum in male

anteriorly with shallow fovea, or with flat area in small specimens, anterior angle rounded, anterolateral margin in dorsal aspect broadly rounded, posterior angle truncate with shallow emargination, lateral and basal margin with marginal line, punctation of dorsal surface double, consisting of coarse irregularly distributed punctures mixed with fine almost regularly distributed punctures separated by approximately 2–3 their diameter, in male coarse punctation remarkably more sparse mainly on disc Scutellum triangulate, with several fine punctures Elytral humerus not denticulate, striae narrow, distinctly impressed, strial punctures regularly spaced, crenating distinctly interval margins, intervals almost flat, finely and sparsely punctate, sutural interval strongly angustate apically Macropterous Metasternal plate in male concave, in female only very shallowly, coarsely, regularly punctate, with complete longitudinal line Ventromedial protibial edge with row of several irregularly spaced and irregularly sized denticles, terminal spur of protibia reaching in male approximately to two thirds of protarsomere 2, in female a little shorter and more slender Apical margin of meso- and metatibia fimbriate with setae equal in length Basimesotarsomere distinctly longer than superior terminal spur of mesotibia Basimetatarsomere distinctly longer than superior terminal spur of metatibia and approximately equal to next three tarsomeres combined Aedeagus as in Figs 21, 22

EPIPHARYNX (Fig 7) Anterior margin with very slightly developed lobes, anterolateral margin slightly crenulate Conical epitorma and pternotormae distinctly sclerotized, area of proplegmatium and apotormae sclerotized Epitorma shortened, not reaching anterior margin Helus anterolaterally with group of 11–13 short, thick setae, basally with several sensillae Corypha with 4–5 short, thick setae Chaetoparia with one row of long setae Chaetopedium covered with group of 24–26 thick setae and numerous remarkably long microtrichiae Acroparia and acanthoparia covered with numerous thin, long setae Apophoba and ipophoba covered with numerous thin setae little shorter than in acroparia and acanthoparia Nesium medially with V-shaped row of sensillae confluent with lateral groups of sensillae and short, fine setae

DISTRIBUTION First record from China (Xizang), Himalayas N Pakistan, India (Uttar Pradesh, West Bengal), first record from Himachal Pradesh and Jammu and Kashmir, Nepal (Ahrens & Stebnicka *1997*, Balthasar *1964*, *1965*, Schmidt *1922*, Stebnicka *1981*, *1987*, *1989*)

Aphodius (*Aphodius*) *reginae* sp. n.
(Figs 8, 23–24)

TYPE MATERIAL Holotype (male) allotype (female) and paratypes Nos 1–6 (males), Nos 7–11 (females) labelled "China N-Yunnan, 27°08'N 100°14'E, Yulongshan mts , 2900–3500 m, Baishui vill 7–12/7'1990 [p]" paratypes No 12 (male) and No 13 female labelled "China, N Yunnan, 27°13'N 100°16'E, Yulongshan mts , 3200 m F slope 14 7 1990 [p]" paratype No 14 (male), labelled "China Yunnan 1 19 VII 1992, Heishui, 27 13N 100 19E, 35 km N of Lijiang [p]" paratype No 15 (female), labelled ' China, pr Yunnan centr , Kunming, Xi Shan, 16 –17 5 1993 [p]" Holotype, allotype and paratypes Nos 1–14 in DKCP, No 15 in RCCP

DESCRIPTION Body length 7 9–8 3 mm (HT – 8 1 mm, AT – 8 3 mm) Oblong, strongly convex, dorsal surface entirely bare, shining, except for alutaceous apex of elytron, colour black, pronotum with yellowish red spot anterolaterally, elytron bicolorous, red with darkened sutura and black spot posteriorly of middle of elytron length, spot triangulate, located transversally from elytral stria 2 to lateral elytral margin, setation of extremities pale

Male Head trapezoidal, only slightly convex Clypeal margin distinctly upturned, anteriorly broadly emarginate, anterior angle rounded, side almost straight towards gena Gena regularly rounded, distinctly exceeding eye, separated from clypeal side by sinuation Clypeus with distinctly elevate, broadly arcuate, transverse carina Medial frontal tubercle remarkably developed, conical with obtuse apex, lateral tubercles less prominent Clypeal surface covered with

fine and simple, almost regular punctation, punctures separated by approximately 1–2 their diameter, posteriorly of frontal tubercles becoming sparser, anteriorly of transversal carina somewhat rugose

Epipharynx (Fig 8) Anterior margin with distinct, setaceous lobes Conical epitorma, pternotormae, area of proplegmatium and apotormae sclerotized Epitorma shortened, not reaching anterior margin Helus anteriorly with group of 10–12 thick setae, mixed with numerous very short, spinlike setae, basally with several sensillae Corypha with 4–5 short, thick setae Chaetoparia with one row of long, relatively thin setae Chaetopedium covered with group of 35–38 long setae and numerous, remarkably long microtrichiae Acanthoparia and lobes of acroparia covered with numerous thin, long setae, each lobe bearing 5–9 of such setae Apophoba and ipophoba covered with numerous thin setae little shorter than in acroparia and acanthoparia Nesium with V-shaped row of sensillae confluent with lateral groups of sensillae and short, spinlike setae

Pronotum strongly convex, anteriorly with shallow medial fovea, broadest just before middle of pronotal length, distinctly narrowed anteriorly Anterior angle rounded, only slightly projecting anteriorly, sides in dorsal aspect straight and distinctly diverging towards approximately half of pronotal length, then straight and slightly converging to truncate but not emarginate posterior angles, posterior margin broadly rounded, not bisinuate Lateral and posterior margin remarkably bordered Basal marginal line with several coarse irregularly spaced punctures Punctation of dorsal surface double, consisting of coarse, very irregularly and sparsely spaced punctures, missing in anterior fovea and along side, mixed with fine regularly spaced, very fine punctures separated approximately by 2–3 their diameter

Scutellum triangulate, sides weakly arcuate, surface with several coarse punctures

Elytra strongly convex, nearly parallel, humerus not denticulate Striae distinctly impressed, strial punctures moderately deeply impressed, regularly spaced, separated by approximately their diameter, dinstinctly crenating margins of intervals Striae 1 and 10 completely developed, reaching nearly apex of elytron, stria 2 joining 3 and 9 just before apex, striae 4–6 a little shortened and confluent subapically, striae 7 and 8 distinctly shortened and confluent approximately in apical 1/6 of elytron length Stria 8 shortened distinctly before humerus Intervals almost flat, very finely, sparsely punctate Sutural interval strongly angustate apically.

Macropterous

Metasternal plate concave, with coarse, sparse, regular punctation, and complete longitudinal line Abdominal sternites with recumbent short setae

Femora with double, irregularly distributed, sparse punctation Protibia with three sharp external teeth and row of 3–4 very feebly developed external denticles in basal half, ventromedial edge with several, remarkably irregularly spaced denticles, 1–2 of them at middle more developed, terminal spur inserting against emargination between medial and apical external teeth, stout and long, reaching approximately to apical third of protarsomere 2, obtusely angulate apically Apical margin and two well developed transversal carinae of meso- and metatibia fimbriate densely with setae equal in length Basimesotarsomere longer than superior terminal spur of mesotibia, inferior terminal spur simply pointed Basimetarsomere distinctly longer than superior terminal spur of metatibia and equal approximately to next three tarsomeres combined

Aedeagus as in Figs 23, 24

Female differs from male as follows clypeal carina and frontal tubercles only very slightly developed, not conical, pronotum without anterior fovea, coarse punctures more dense, terminal spur of protibia slender, apically pointed Metasternal plate almost flat.

DIFFERENTIAL DIAGNOSIS. The new species is similar to *A.* (*A.*) *elegans* and *A.* (*A.*) *fasciger*. For the differentiation from those species see the complex of diagnostic characters in the key below.
COLLECTION CIRCUMSTANCES. All specimens were collected at open pastures from bovine dung.
NAME DERIVATION. Matronymic, named in honour of my wife Regina.

Aphodius aeger Sharp, 1878

Aphodius aeger Sharp, 1878: 170
Aphodius (*Aphodius*) *aeger*: Schmidt, 1913: 161; 1922. 271, 275; Balthasar, 1932b: 117; 1964: 363, 370; Dellacasa, 1988a. 83, 369

TYPE LOCALITY. Yangihissar, Yarkand [= Yengisar, Shaché; China: W Xinjiang prov.] (Sharp 1878).

NOTE. No material available. The species is known to me only from short, unsufficient original description by Sharp (1878) repeated also in Schmidt (1922) and Balthasar (1964). According to Horn et al. (1990) now the collection of David Sharp is kept in MNHN. But unfortunately I had no opportunity to study types from Sharp's collection for the moment.

Aphodius corallifer W. Koshatschikov, 1913

Aphodius (*Aphodius*) *corallifer* Koshantschikov W., 1913: 262, Schmidt, 1922: 271, 275; Boucomont, 1929: 785; Balthasar, 1932b. 117, 1964: 363, 367; Dellacasa, 1988a: 115, 370

TYPE LOCALITY. Ningpo [= Ningbo, China: Zhejiang prov.] (Koshantschikov 1913).

NOTE. No material available. The species is known to me only from short, unsufficient original description by Koshantschikov (1913) repeated also in Schmidt (1922) and Balthasar (1964). According to Horn et al. (1990) now the collection of Wassilij Koshantschikov is kept in ZMAS. Unfortunarely I did not found any type specimen of the species in St. Petersburg museum during my visit in 1996 there.

Key to species of the subgenus *Aphodius* known from China and the Himalayas (excluding of *A. aeger* and *A. corallifer*)

1 (8) Elytron unicolorous black, red or dark red without black band and/or spots. Basimetatarsomere shorter, equal in length or longer than superior terminal spur of metatibia.
2 (3) Elytron black, anterior pronotal margin slightly bordered. Ventromedial edge of protibia in male with row of regularly spaced 4–5 small denticles. China: Xinjiang; Europe to W Siberia ... *A.* (*A.*) *frater* Mulsant et Rey
3 (2) Elytron red or dark red, anterior pronotal margin without border. Ventromedial edge of protibia with row of several considerably irregularly spaced, small denticles.
4 (5) Abdominal sternites red or reddish brown. Basimetatarsomere shorter than superior terminal spur of metatibia. China: Xinjiang; Europe to Transbaikalia and Yakutia ... *A.* (*A.*) *foetens* (Fabricius)
5 (4) Abdominal sternites black. Basimetatarsomere at least equal to superior terminal spur of metatibia.
6 (7) Gena subtruncate, not exceeding eye laterally. Strial punctures of elytron crenating considerably interval margins. Basimetatarsomere approximately equal to superior terminal spur of metatibia. China: Sichuan, Xinjiang, Xizang, throughout W Palaearctics to Nepal, Transbaikalia and Yakutia, introduced to the North America and Australia ... *A.* (*A.*) *fimetarius* (Linnaeus)
7 (6) Gena rounded, exceeding distinctly eye laterally. Strial punctures of elytron crenating only slightly interval margins. Basimetatarsomere longer than superior terminal spur of metatibia. China: Fujian, Guangdong, Sichuan, Yunnan ... *A.* (*A.*) *calichromus* Balthasar
8 (1) Elytron bicolorous yellow, reddish yellow or red with black band and/or spots. Basimetatarsomere distinctly longer than superior terminal spur of metatibia.

9 (10) Elytron with black band situated distinctly at middle of elytral length, and with black humeral and apical spot China: Xizang, Himalaya from Pakistan to Nepal . . . . . *A. (A.) irregularis* Westwood in Royle

10 (9) Elytron with black band situated distinctly posteriorly of middle of elytral length, in some specimens also with black humeral spot or with black almost whole posterior half of elytron

11 (12) Large species with body length 9.3–14.1 mm. Anterior angle of pronotum black. Humeral spot always missing. China: Anhui, Fujian, Gansu, Guangdong, Guizhou, Henan, Hubei, Jiangsu, Jiangxi, Liaoning, Qinghai, Shandong, Shanghai Shi, Sichuan, Taiwan, Xinjiang, Xizang, Yunnan, Zhejiang; Russian Far East, N Korea, Japan, N Vietnam, Laos . . . . . *A. (A.) elegans* Allibert

12 (11) Smaller species with body length 5.5–8.3 mm. Anterior angle of pronotum yellow, reddish yellow or red

13 (14) Anterolateral pronotal margin in dorsal aspect straight. Elytral intervals slightly convex. Black band reaching medially mostly to stria 2 of elytron (Fig. 25). Body length 7.9–8.3 mm. China: Yunnan . . . . . *A. (A.) reginae* **sp. n.**

14 (13) Anterolateral pronotal margin in dorsal aspect broadly rounded. Elytral intervals flat. Black band reaching medially mostly to elytral suture, some specimens with whole posterior half of elytron black and/or with black humeral spot. Body length 5.5–7.0 mm. China: Guizhou, Shandong, Sichuan, Xizang, Yunnan; Himalayas from Nepal to Assam . . . . . *A. (A.) fasciger* Harold

DISCUSSION

Species of the nominotypical subgenus of the genus *Aphodius* known from the territory under study (8 species in the key above) represent closely homogeneous, probably monophyletic group of related species. They exert similar external morphology including shape of aedeagus and shape and setation of epipharyngeal structures. The only exception is represented by *A. (A.) frater* being by some authors (e. g. Dellacasa 1983, Nikolaev 1987, Veiga 1988) treated in monotypical subgenus *Loraspis* based on the following differences from the subgenus *Aphodius*: head strongly convex, pronotum anteriorly with marginal line, epitorma anteriorly projecting to long, rather curved sclerotized zygum. These features are to be found also in other representatives of the genus *Aphodius* (e. g. some species of the subgenus *Ammoecius* Mulsant, 1842), combining not complex of synapomorphies justifying to establish special subgenus for *Aphodius frater*. But on the other hand it is interesting that most of species of both the mentioned subgenera (*Aphodius*, *Ammoecius*) are at least facultatively saprophagous.

The species under study represent from the zoogeographical point of view two distinct groups. The first group contains three widespread Palaearctic species, *A. (A.) fimetarius*, *A. (A.) foetens* and *A. (A.) frater*. The second group is distributed from the Himalayas through high mountains of transitional zone between the Palaearctic and the Oriental regions (Laos, Vietnam and SE China), and central and northern parts of China to the Russian Far East and Japan, and includes the following five species: *A. (A.) elegans*, *A. (A.) fasciger*, *A. (A.) irregularis* and *A. (A.) reginae* sp. n. Limits of distribution of the two groups are essentially not overlapped (excl. of *A. (A.) fimetarius*). This probably results from different requirements for moisture. The former group is adapted to much larger oscillations of the continental climate. *A. (A.) fimetarius* can be considered as an exception, which is also present in the western and central parts of the Himalayas, where it, however, prevalently inhabits dry, northwestward oriented slopes. Thus, an information is of interest, concerning the occurrence of this species in Sichuan (Zhang 1992), where high mountains also form a mosaic of relatively dry and wet biotopes mostly with very distinct demarkation lines. The species of the latter group are distributed in relatively moist, warm areas, affected by monsoon periods. *A. (A.) elegans* is an example of the penetration of these elements as far as to the lower part of the river basin of Ussuri and to Japan.

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Note on the distribution of *Mus spicilegus* (Mammalia: Rodentia) in the south-western Balkans

Miloš MACHOLÁN[1] & Vladimír VOHRALÍK[2]

[1] Institute of Animal Physiology and Genetics, AS CR, Veveří 97, CZ–602 00 Brno, Czech Republic
[2] Department of Zoology, Charles University, Viničná 7, CZ–128 44 Praha 2, Czech Republic

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Abstract. Skulls of mice of the genus *Mus* Linnaeus, 1758 from two localities in Albania and a single locality in NW Greece were evaluated using nonmetric morphological criteria as well as bivariate and multivariate morphometric analyses. While the morphological analysis showed the mice to be conspecific with the hillock mouse, *M. spicilegus* Petényi, 1882, both the bivariate and multivariate analysis revealed a fairly high level of differentiation from the main stock of the species and a close affinity to a mound-builder population from Ulcinj, recently described as a distinct subspecies. The mice investigated in the present study are first specimens of *M. spicilegus* recorded in Albania and Greece.

Morphometrics, distribution, zoogeography, hillock mice, *Mus spicilegus*, SW Balkans

INTRODUCTION

The distribution of the mound-building mouse (hillock mouse), *Mus spicilegus* Petényi, 1882, has long been poorly understood, mostly due to its morphological similarity to the house mouse, *M. musculus* Linnaeus, 1758, on the one side, and the Macedonian mouse, *M. macedonicus* Petrov et Ružić, 1983, on the other. Thus, in the former case, misidentifications has led, among others, to wrong conclusions on the north-western border of the *M. spicilegus* range (see Macholán 1995, 1996b for details) as well as on the occurrence of this species in such places as mountains and/or buildings. In the latter case, confusing the hillock mouse with its close relative, *M. macedonicus*, obscured the distribution and evolutionary history of outdoor mouse species in south-eastern Europe. To give just a single example, Miller (1912) described house mice from „various localities" in Montenegro and Albania under the subspecific name *spicilegus*. Yet he applied the same name for mice from the Pannonian lowland as well as for those from Sweden and the Baltic coast of Germany and thus, in spite of the great information potential Miller's report could have had, the actual status of his specimens from Montenegro and Albania is necessarily equivocal.

It was about two decades ago that methods of biochemical and molecular genetics shed light into the then intricate systematics of the genus *Mus* Linnaeus, 1758. Accurate identification of mouse species, using enzyme electrophoresis, subsequently enabled to develop morphological and morphometric tools for diagnostics of individual species (Darviche & Orsini 1982, Gerasimov et al. 1990, Macholán 1996a and references therein).

Recently, attention was paid to the systematic status and morphological relationships of a presumably isolated population of mound-builders from the vicinity of the town of Ulcinj, Montenegro, living at the shore of the Adriatic Sea (Kryštufek & Macholán, in press). It has been shown that in spite of a close affinity to *M. spicilegus* (mound-building behaviour, morphological diagnostic criteria), the Ulcinj population is morphometrically remarkably differentiated

from both *M. macedonicus* and other *M. spicilegus* populations. This has led to the description of the population as a new subspecies of *Mus spicilegus* (Kryštufek & Macholán, in press).

Currently, our knowledge on the range of the Adriatic subspecies and, at the same time, on the SW distribution border of the hillock mouse in general, is limited to the Ulcinj beach. Therefore, we focused on evaluating voucher specimens of mice from Albania and NW Greece, deposited as skulls and skins in the collections of the Charles University and the National Museum in Prague.

MATERIAL AND METHODS

The very core of the material under study encompasses one male from Scodra at the NW limit of the town of Shkodër (NW Albania, alt. 20 m asl.; National Museum, No. 7812/68, leg. 16.5.1958 staff of the Institute of Parasitology), previously misidentified as *M. musculus*, one male from Tirane (central Albania, alt. 140 m asl., Charles Univ., No. A90, leg. 29.9.1960 Hanák), tentatively identified as *M. abbotti* (=*M. macedonicus*) in the collection protocol; and two males and one female from Vlaherna (Arta Distr., Epirus, NW Greece, alt. 20 m asl.; Charles Univ., Nos. BG3123, BG3124, BG3125, leg. 15.–16.8.1985 Vohralík), referred to as *M. abbotti* (=*M. macedonicus*) in Sofianidou & Vohralík (1991) (Fig. 1).

The individuals listed above were compared with the Ulcinj population (U, n=21) as well as with samples of all five taxa of mice from throughout Europe and northern Africa. *M. spicilegus* originated from Austria (SA, n=19), Ukraine & Moldavia (SU, n=26), and Yugoslavia (SY, n=6); *M. macedonicus* from Greece (MG; n=24), Macedonia (MM, n=25), and Turkey (MT, n=12). *M. spretus* originated from Morocco and Tunisia (SPA; n=30), S Spain (Granada, SPE; n=17), and S France (Petit Travers, La Chapelle, La Gardiole; SPF; n=12); *M. domesticus* samples were from S Albania and Montenegro (Sarandë, vicinity of Lake Butrintit, Queparo, Ulcinj, DA, n=19), Germany (Eisenburg, Reichertshofen b. Ingolstadt; DD, n=14), and Greece (Macedonia; DG; n=20). *M. musculus* samples were from the Czech Republic (Břeclav; MCZ; n=21) and Slovakia (Ruská Poruba, MSK, n=20). The voucher specimens are deposited at the Montpellier University II (*M. spretus*), National Museum in Prague and Slovene Museum of Natural History in Ljubljana (DA), Zoologische Staatssammlung in Munich (DD), Charles University in Prague (DG) and Institute of Landscape Ecology in Brno (MCZ, MSK). Details on the *M. spicilegus* and *M. macedonicus* samples are given in Kryštufek & Macholán (in press).

Morphological diagnostic keys described in Macholán (1996a) were used for identification of individual samples and 31 cranial and dental measurements were taken for multivariate analyses as described in Kryštufek & Macholán (submitted). Only mature non-senescent animals were measured. Canonical variate analysis (CVA) on all the 31 variables was used to examine among-groups relationships ('size-in' analysis). In order to assess the relative influence of size and shape and extract the size or growth component from the data ('size-out' analysis), the following procedure was adopted: first, multiple-group principal components analysis (MGPCA) was carried out on the 17 cranial and 14 dental variables separately since the two data subsets were shown to be independent as to their 'size' vectors (Kryštufek & Macholán, submitted); then the first principal components, supposed to encompass the size components, were excluded from both the cranial and dental data sets. In the following step, the two subsets were pooled to give a single set of 29 size-independent variables and these in turn served as an input for subsequent 'size-out' CVA (Klingenberg, pers. comm.).

RESULTS AND DISCUSSION

Mice from Tiranë and Vlaherna (the skin of the Shkodër specimen was not available) were short-tailed and light coloured, and quite similar to *M. macedonicus* from N Greece (about 350 skins examined by V. V.). The only apparent difference between Greek *Mus macedonicus* and the individuals under study was the coloration of the ventral part which appeared to be snowy white in the latter while being darker, whitish to white-grey and sometimes (in old animals) even ochraceous, in the former. Furthermore, the demarcation line between the light belly and the yellowish-brown dorsal part was more distinct in the specimens from Tiranë and Vlaherna than in northern-Greek *M. macedonicus*.

The values of zygomatic index of all the five specimens measured were higher than 0.72, suggesting those animals to belong to the group of outdoor species (Macholán 1996a). Their skulls were rounded in the lateral view, with smooth ventral wings of the parietals and straight to concave anterior margin of relatively tall and narrow zygomatic plate. The lingual outline of M^2 was concave. This clearly placed the specimens studied within the *M. spicilegus* stock.

In Fig 2, two bivariate plots are shown, which appeared to be of some value in discrimination between the Ulcinj population and other hillock mouse populations (Kryštufek & Macholán, in press) In Fig 2A, the width of M_1 (LaM1i) is plotted against its length (LM1i) and this graph separates fairly well all the three groups, namely *M macedonicus* (squares), *M spicilegus* (circles), and „Ulcinj" (triangles), the five specimens concerned, indicated by closed symbols, appear within the Ulcinj cluster When the width of the zygomatic arch (B) is plotted against LaM1i (Fig 2B), the Ulcinj sample overlaps with *M macedonicus*, whereas *M spicilegus* is clearly separated, the position of the Albanian and Greek mound-builders is rather intermediate

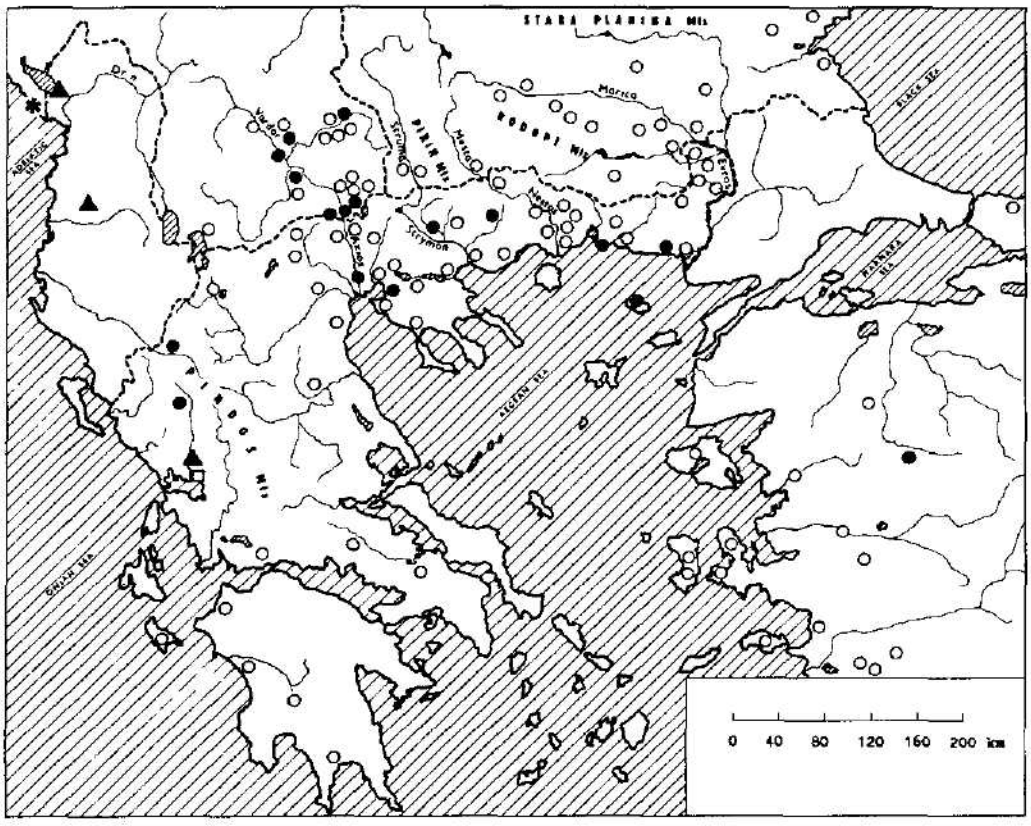

Fig 1 Map of the southern Balkans with sampling localities of the Adriatic subspecies of *M spicilegus*, indicated by black triangles, an asterisk shows the type locality of the taxon *M macedonicus* sites are indicated by circles those sites from which the mouse skulls were investigated with multivariate morphometric analysis are indicated by filled circles whereas open circles show localities taken from literature (*Greece* Ondrias 1966, Kock 1974, Niethammer 1974, Vohralík & Sofianidou 1987, 1992, Sofianidou & Vohralík 1991, Macholán 1996b, *Bulgaria* Paspalev et al 1950, Markov 1962, 1964, Bonhomme et al 1983, Vohralík 1985, Vohralík et al , in press, *Yugoslavian Macedonia* Petrov 1992, Macholan 1996b, Vohralík et al , in press , *Turkey* Felten et al 1971, Kryštufek & Macholan, in press) The systematic status of short-tailed mice from Limni (Ondrias 1966), a site south of Vlaherna (open square), is uncertain

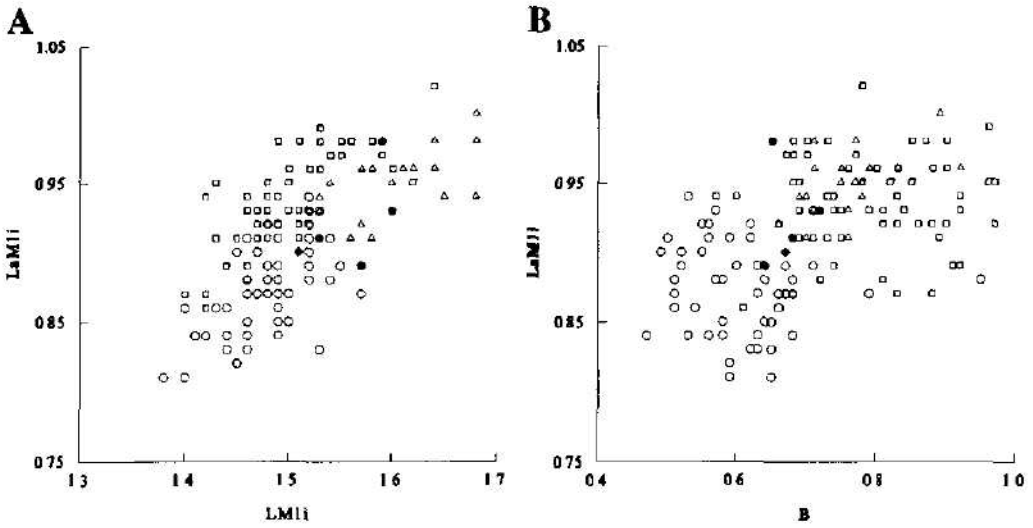

Fig. 2 A – Bivariate plot of the width of the first lower molar (LaM1i) against its length (LM1i); B – LaM1i plotted against the width of the zygomatic arch (B). Symbols: squares – *M. macedonicus*; circles – *M. spicilegus*; triangles – the Ulcinj population; diamond – Shkodër (N Albania), star – Tiranë (central Albania); pentagons – Vlaherna (NW Greece)

The multivariate analyses were divided into two steps: in the first step, both 'size-in' and 'size-out' CVA were performed on eastern-European outdoor species only. As shown in Fig. 3A, the Ulcinj population was clearly separated from both outdoor species. The position of the animals from Albania and NW Greece seems to be intermediate between this and other *M. spicilegus* populations due mostly to two individuals from Vlaherna. However, the discrimination analysis showed all but one individual to belong to the Ulcinj population (U), the only exception being a single specimen from Vlaherna, misidentified as *M. spicilegus* from Ukraine (SU). The minimum-length spanning tree (MST), superimposed over the group centroids (Fig. 3B), connected the Vlaherna, Shkodër and Tiranë specimens with the Ulcinj population which, in turn, showed morphometric affinity to Greek *M. macedonicus* (cf. also Kryštufek & Macholán, in press). In the 'size-out' analysis, all the three samples under study again appeared closest to the Ulcinj population, yet this was connected to the Ukrainian (SU) sample (Fig. 3C).

The results of these multivariate analyses confirm the systematic position of the animals studied within the Adriatic subspecies even though the level of their morphometric differentiation from hillock mice from the main range seems to be slightly lower than that of the Ulcinj population. It should be noted, however, that the samples comprise single or very few individuals each and this does not allow us to conclude more closely on the level of their morphometric divergence.

In the second step, samples of the remaining three mouse taxa were added to the analysis in order to assess the morphometric relationship between the eastern outdoor species and subspecies and their western-European outdoor counterpart, *M. spretus* Lataste, 1883, as well as two commensal species, *M. domesticus* and *M. musculus*. In this case, given the close relation to the Ulcinj population, the Albanian and Greek hillock mice were pooled with the Adriatic subspecies. Both 'size-in' (Fig. 4A) and 'size-out' (Fig. 4B) analyses showed a quite similar pattern,

where the eastern outdoor mice were distinctly separated from the commensal taxa and *M. spretus* had a „central" position in between.

Although this study does not pertain to any phylogenetic inferences, it is worth mentioning that the MST patterns resemble closely the evolutionary relationships within the whole group of European mouse species as revealed by molecular studies (see Boursot et al. 1993, Sage et al. 1993 for a review), including the mutual positions of African, Spanish and French *M. spretus* samples, apparently reflecting the colonization route from presumptive ancestral African populations, through Spain to southern France. The situation is summarized in Fig. 5, where the MST from Fig. 4B is superimposed onto the map of sampling localities of the outdoor mouse populations (commensal taxa are omitted in the figure).

The position of the *M. spretus* lineage close to a common ancestor of the European mouse taxa seems to be corroborated also by the relatively high variation in some morphometric traits

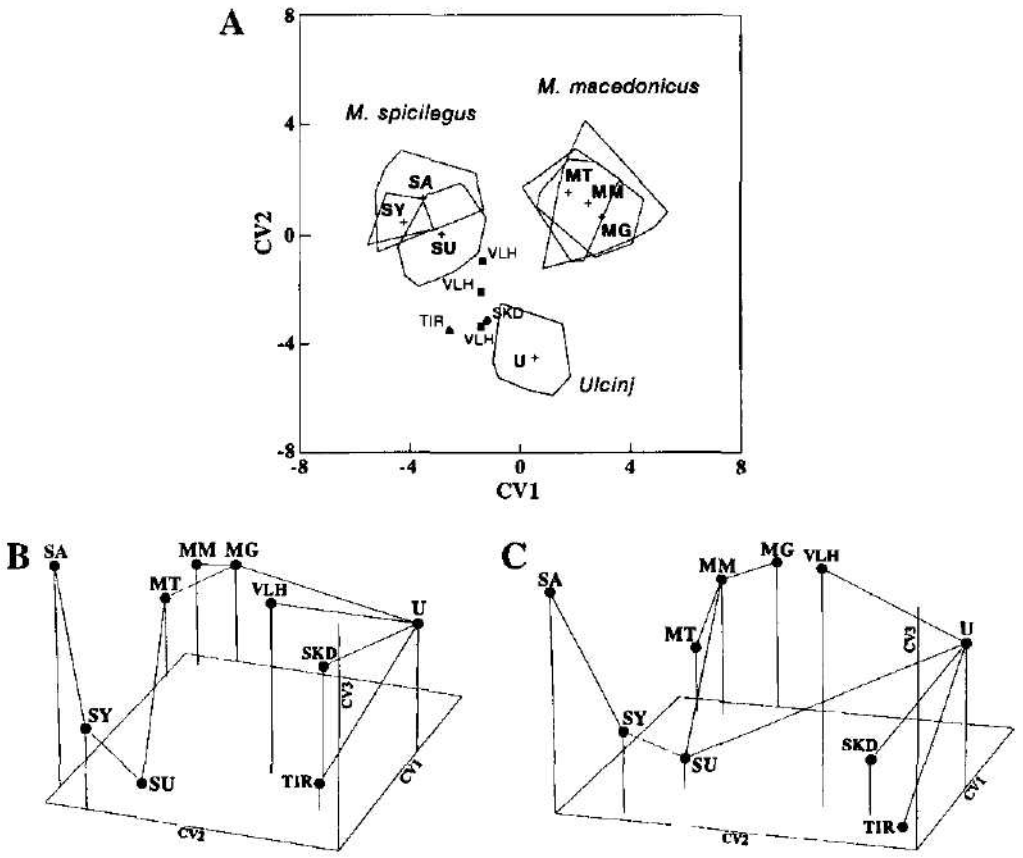

Fig. 3 A – Plot of the first two canonical variates as revealed by the 'size-in' CVA. Sample acronyms are as follows: *M. macedonicus* MG – Greece, MM – Macedonia, MT – Turkey, *M. spicilegus*, SA – Austria, SU – Ukraine and Moldavia, SY – Voivodina, Yugoslavia, U – Ulcinj; SKD – Shkoder, TIR – Tiranë; VLH – Vlahema B – Three-dimensional plot of the first three canonical axes; minimum-length spanning tree (MST) is superimposed onto the group centroids C – 3D plot of population centroids based on 'size-out' CVA.

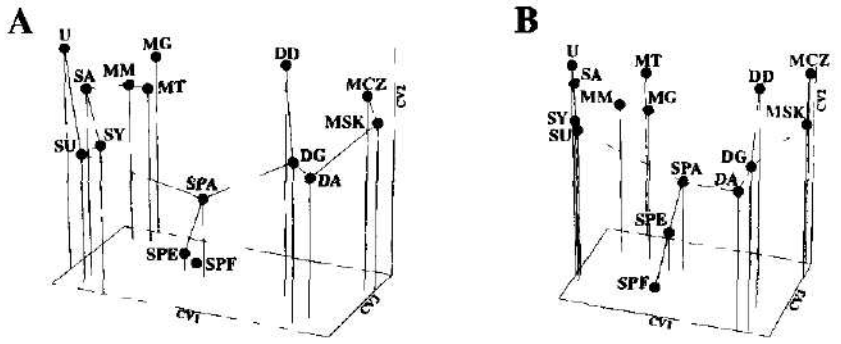

Fig 4 A – 3D plot based on 'size-in' CVA of populations representing all the European mouse species B – 3D plot based on 'size-out' CVA MST superimposed onto the group centroids SKD, TIR and VLH samples were included in the Ulcinj population (U) Acronyms *M spretus* SPA – Morocco and Tunisia, SPE – Spain, SPF – France, *M domesticus* DA – Albania and Ulcinj, DD – Germany, DG – Greece, *M musculus* MCZ – Czech Republic, MSK – Slovakia, acronyms for remaining populations are the same as in Fig 3

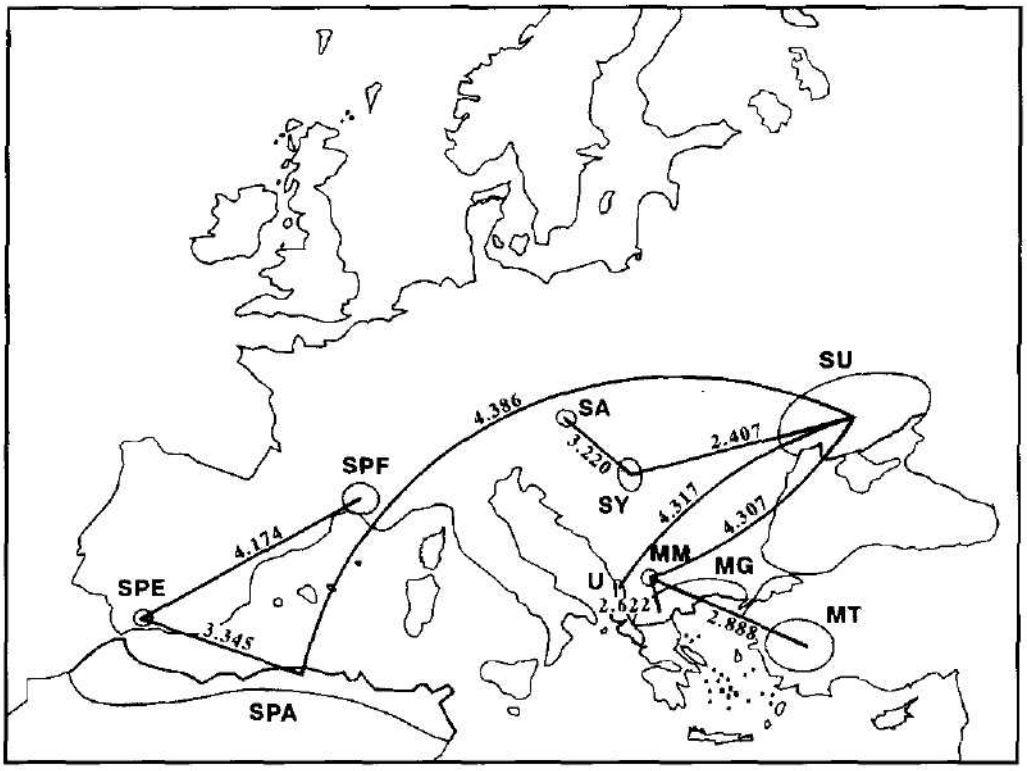

Fig 5 Map of Europe, Asia Minor and northern Africa with sampling sites of outdoor mice populations, interconnected with MST, indicated. Numbers represent Mahalanobis distances taken (together with MST) from 'size-out' CVA (see Fig 4B for details).

such as the shape of the zygomatic plate, the shape of M_1, and especially the shape of the lingual outline of M^2, which fluctuated even within a single population between both extremes while being much more consistent in all the remaining taxa (M. Macholán, unpubl. results).

It can be concluded that, according to the multivariate morphometric analyses and the evaluation of diagnostic morphological traits, the lowlands around Lake Shkodër and those stretching along the Adriatic and Ionian coast as far as the Arachthos River in NW Greece are inhabited by mice recently described from Ulcinj, Montenegro as a distinct subspecies of *M. spicilegus* (Kryštufek & Macholán, in press). All hitherto known records of this subspecies are confined to localities situated nearby the seashore and within the altitudinal range from the sea level (Ulcinj) to 140 m (Tiranë). On the contrary, mice collected at two inland and higher-situated Epirus localities (Konitsa and Perama, both 480 m asl.), examined by the authors (cf. Fig. 1), belong undoubtedly to the Macedonian mouse, *Mus macedonicus*. This suggests the Adriatic subspecies of *M spicilegus* prefers coastal and lower-situated sites in that region. Because the occurrence of outdoor short-tailed mice was reported also from other lowland localities along Greek western seashore as far southwards as to S Peloponnesos (Fig. 1), it would be highly desirable to check their specific status. This raises also the question about the western limit of *M. macedonicus*, which was considered to occupy the whole area of the S Balkans from European Turkey throughout Bulgaria, Greece and the southern parts of Yugoslavian Macedonia to Albania (see, for instance, the notoriously known and frequently reappearing picture by Bonhomme et al. [1984, Appendix I]) and its conceivable ecological interactions with the hillock mouse as well.

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Sternal pneumatization in the waterfowl (Aves: Anatidae)

Jiří MLÍKOVSKÝ

Vršovická 11, CZ–101 00 Praha 10, Czech Republic.

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Abstract. Sternal pneumatization in the Anatidae is reviewed. It is shown, that ancestral forms had highly pneumatized sterna. During evolution, sternal pneumaticity has been often reduced, and several diving forms lost is entirely. Presence of additional pneumatic foramina makes it probable, that *Anas* (*Lophonetta*) *specularioides* King, 1828 is not related to the genus *Anas*, but more probably belongs with the core cariamine genera *Cariama*, *Plectropteron* and *Alopochen*.

Sternum, pneumatization, evolution, Aves, Anatidae, world-wide fauna

INTRODUCTION

The waterfowl (Anatidae) is a higly diversified group of birds (Mlíkovský 1987), which is reflected in morphological adaptations. In the present paper I describe variations in the pneumatization of the waterfowl sternum, with special respect to their adaptive and phylogenetic significance.

No detailed study of sternal pneumatization in the waterfowl has been performed so far, although it is well known, that the condition varies among the genera (Verheyen 1955, Woolfenden 1961). Livezey (1986) included data on sternal pneumatization in his phylogenetic analysis of Recent anseriform genera.

The sterna were examined in the comparative collections in the Paleontological Institute of the Russian Academy of Sciences (Moskva), in the Natural History Museum (Paris), and in the author's collection (Praha). Sterna of the Miocene anatid *Mionetta* was studied in the Natural History Museum in Berlin. I was kindly allowed to work in the collections by A. A. Karchu (Moskva), C. Lefèvre (Paris), and B. Stephan (Berlin). I thank them all. See Appendix for the list of examined taxa. Taxonomic arrangement of the waterfowl follows Johnsgard (1979).

STERNAL PNEUMATIZATION

Most of the modern waterfowl have pneumatized sterna with a single pneumatic foramen in the anterior part of the sternal basin (Tab. 1). Additional foramina are present is others, while several waterfowl genera possess non-pneumatic sterna.

Additional pneumatic foramina („lateral foramina") can occur in the sternal basin either along its borders. I found the latter condition in *Coscoroba*, *Anser*, *Branta*, *Alopochen*, *Plectropterus*, and *Anas specularioides*. Hints of these foramina were also present in some individuals from the genera *Dendrocygna* (*bicolor*). In addition to these lateral foramina, also the midline of sternal basin can be perforated. I observed this condition in *Cygnus* (s. str.), and *Cairina*. Hints of the medial perforation were also present in one of two specimens of *Anser cygnoides*, and in *Chloephaga melanoptera*. *Anseranas* has both lateral and medial pneumatic foramina in the sternal basin, but lacks the anterior pneumatic foramen.

Table 1 Patterns of sternal pneumatization in the waterfowl and allied taxa A – anterior foramen in the sternal basin, B – medial foramina in the sternal basin, C – lateral foramina in the sternal basin, D – foramina on the ventral side of the sternal basin, along keel basis, E – foramen in the frontal edge at manubrium + = present, (+) = variable, – = absent Data for taxa marked by an asterisk were derived from Livezey (1986)

	A	B	C	D	E
Phoenicopterus	+	+	+	–	(+)
Chauna	(+)	+	+	–	(+)
Anseranas	–	+	+	–	–
Dendrocygna	+	–	(+)	–	–
Mionetta	–	–	–	–	–
*Thalassornis**	–	–	–		
Cygnus (Cygnus)	+	(+)	+	(+)	–
Cygnus (Olor)	–	–	(+)	–	–
Coscoroba	+	–	+	+	+
Anser	+	(+)	+	–	–
Branta	+	–	+	–	–
Cereopsis	+	–	–	–	–
*Stictonetta**	+	–	–		
*Cyanochen**	+	–	–		
Chloephaga	+	(+)	(+)	–	–
*Neochen**	+	–	–	–	–
Alopochen	+	–	+	–	–
Tadorna	+	–	–	–	–
Tachyeres	–	–	–	–	–
Plectropterus	+	–	+	–	–
Cairina	+	+	+	–	–
*Pteronetta**	+	–	–	–	–
*Sarkidiornis**	+	–	–	–	–
Nettapus	+	–	–	–	–
Calonetta	+	–	–	–	–
Aix	+	–	–	–	–
Chenonetta	+	–	–	–	–
Amazonetta	+	–	–	–	–
*Merganetta**	+	–	–	–	–
*Hymenolaimus**	+	–	–	–	–
Anas	+	–	–	–	–
A specularioides	+	–	+	–	–
*Malacorhynchus**	+	–	–	–	–
Marmaronetta	+	–	–	–	–
*Rhodonessa**	+	–	–	–	–
Netta	+	–	–	–	(+)
Aythya	(+)	–	–	–	–
Somateria	–	–	–	–	–
Polysticta	+	–	–	–	–
*Camptorhynchus**				–	
Histrionicus	+	–	–	–	–
Clangula	–	–	–	–	–
Melanitta	–	–	–	–	–
Bucephala	+	–	–	–	–
Mergus	+	–	–	–	–
*Heteronetta**	–	–	–	–	–
Oxyura	–	–	–	–	–
Biziura	–	–	–	–	–

Coscoroba is unique in having pneumatic foramina along the keel basis at the ventral side of the sternal basin

Rarely, pneumatic foramina are present also in the front of the sternum (*Cygnus*, *Coscoroba*, and *Netta peposaca*) In *Cygnus* (sg *Olor*), sternal keel is inflated, and contains loop of trachea (see also Wetmore 1951), which enters the keel through the anterior edge

Non-pneumatic sterna are typical for *Thalassornis*, *Somateria*, *Melanitta*, *Clangula*, *Tachyeres*, *Oxyura*, *Biziura*, and the Miocene *Mionetta Aythya* has a very small anterior pneumatic foramen, which is even absent in some individuals *Aythya* is apparently at the evolutionary wedge between pneumatic and non-pneumatic sternum

Close relatives of the Anatidae (Anhimidae and Phoenicopteridae) have highly pneumatized sterna (see Tab 1)

DISCUSSION

Adaptive significance of sternal pneumatization

All the waterfowl genera, which lack sternal pneumatization, are specialized for diving Also *Aythya*, which tends to lose pneumatic sterna, is a genus of diving ducks Not all these genera are closely allied to each other (see Livezey 1986) This makes probable, that diving ducks increase their body density by limiting pneumatization of their skeleton, incl sternum However, having non-pneumatic sterna is not a necessary condition for the evolution of diving habits in the waterfowl, because *Mergus*, *Bucephala*, *Histrionicus*, and *Polysticta*, also specialized for diving, have pneumatic sterna Absence of sternal pneumatization in the Miocene whistling duck *Mionetta* indicates that it evolved diving habits

Taxonomic implications

Anaseranas has a unique pneumatization pattern of sternum This is in accord with many other peculiarities it has, and supports its separation from the family Anatidae, advocated earlier by Livezey (1986) and Mlikovsky (1996)

Marked differences in sternal pneumatization between swan subgenera *Cygnus* and *Olor* support the view, that they should be separated at the generic level (cf Wetmore 1951, Livezey 1986, Mlikovsky & Švec 1986)

Within the Anserinae (sensu Johnsgard 1979), *Cygnus*, *Coscoroba*, *Anser* and *Branta* have highly pneumatized sterna *Cygnus* (sensu stricto), *Olor* and *Coscoroba* differ from *Anser* and *Branta* in having an additional frontal pneumatic foramen In the Anatidae, I found this foramen also in the single specimen of *Netta peposaca* This South American species is sometimes separated at the generic level as *Metopiana*, but no doubts have been casted on its affinities to *Netta* Study of further specimens of *Netta peposaca* is needed to see, whether frontal pneumatic foramen is a standard character in this species *Cereopsis* and *Stictonetta* have reduced pneumaticity of sterna, similar to typical Anatinae

Within the Anatinae, a group of genera, formerly united in the tribe Cairinini (*Alopochen*, *Cairina* and *Plectropteron*) have additional, lateral pneumatic foramina in the sternal basin This supports their close affinities one to another Lateral pneumatic foramina in sternal basin are present also in *Anas specularioides* It is a less known South American duck, often separated at the genus level as *Lophonetta* (Riley 1914, Boetticher 1952, Wolters 1975–1982) Boetticher (1952) placed *Lophonetta* in the neighbourhood of *Tadorna*, but pneumatization patter of sternum provides evidence, that it is more closely related to Cairinini (sensu stricto) *Anas* is a broad, weakly defined genus of generalized ducks (cf Mlikovsky 1987), and it is well possible,

that unrelated species are still included in it. Previously, this was proven for *Salvadorina waigiuensis* (Mlíkovský 1989).

Different pneumatization patterns in diving ducks indicate, that *Mergus* and *Bucephala* are not closely related to the so-called marine diving ducks (*Melanitta*, *Clangula*, etc.), as is often assumed (e. g. Livezey 1986). This finding supports the conclusions of Brush (1976).

Livezey (1986) listed *Polysticta* among the taxa with non-pneumatic sterna, but the specimen I examined had distinct anterior pneumatic foramen in sternal basin. This might be individual variation, but at least some *Polysticta* individuals still possess pneumatic sterna. This is further character, which separates *Polysticta* from typical eiders of the genus *Somateria* (see also Livezey 1986, Oates & Principato 1994), to which it otherwise appears to be closely related (Woolfenden 1961, Brush 1976, Livezey 1986).

Evolutionary patterns

Screamers, closely related to the Anatidae, have highly pneumatized sterna. This is true also for *Anseranas*, *Cygnus*, and *Coscoroba*, which are generally considered most ancient anatids. This makes highly probable, that ancestral Anatidae had highly pneumatized sterna, with several pneumatic foramina. In the course of evolution, sternal pneumatization became reduced. A single pneumatic foramen is thus characteristic for most of the derived Anatidae. In diving forms, sternum has often lost pneumaticity, presumably in order to increase body density. This state is known already in the ancestral Dendrocygninae (sensu Johnsgard 1979), where *Mionetta* and *Thalassornis* possess non-pneumatic sterna. Obviously, loss of sternal pneumaticity evolved several times in the Anatidae.

Reversal of the common evolutionary pattern, leading from high pneumaticity to its loss, is possible in the Cairinini (sensu stricto). Their sterna are well pneumatized and have additional pneumatic foramina in the sternal basin. In this, proper Cairinini are similar to geese, with which they are apparently unrelated (Woolfenden 1961, Brush 1976, Livezey 1986). Re-gaining high pneumaticity of sternum might be an adaptation to terrestrial life habits of these birds.

CONCLUSIONS

Ancestral Anatidae appear to have had highly pneumatized sterna. Later, pneumatization became reduced in various phyletic lines. Several taxa, specialized for diving, lost sternal pneumatization.

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APPENDIX

List of examined species

Taxonomic arrangement of the Anatidae follows Johnsgard (1979) Usually, only one specimen per species was examined Higher numbers are given in parentheses

Phoenicopteridae *Phoenicopterus ruber* Linnaeus, 1758 (5)
Anhimidae *Chauna chavaria* (Linnaeus, 1766) (9)
Anseranatinae *Anseranas semipalmata* (Latham, 1798)
Dendrocygninae *Dendrocygna arborea* (Linnaeus, 1758), *D javanica* (Horsfield, 1821), *D bicolor* (Vieillot, 1816), *D autumnalis* (Linnaeus, 1758), *D viduata* (Linnaeus, 1766)
Anserinae *Cygnus* (*Cygnus*) *olor* (Gmelin, 1789) (4), *C melanocoryphus* (Molina, 1782), *C atratus* (Latham, 1790), *Cygnus* (*Olor*) *buccinator* Richardson, 1832, *C cygnus* (Linnaeus, 1758) (2), *C bewickii*, *C columbianus* (Ord, 1815), *Coscoroba coscoroba* (Molina, 1782), *Anser anser* (Linnaeus, 1758) (2), *A albifrons* (Scopoli, 1769) (2), *A cygnoides* (Linnaeus, 1758) (2), *A indicus* (Latham, 1790) (3), *A fabalis* (Latham, 1787) (2), *A erythropus* (Linnaeus, 1758) (2), *A caerulescens* (Linnaeus, 1758) (2), *A rossi* Cassin, 1861, *Branta canadensis* (Linnaeus, 1758), *B leucopsis* (Bechstein, 1803), *B ruficollis* (Pallas, 1769), *B bernicla* (Linnaeus, 1758) (2), *B sandvicensis* (Vigors, 1834), *Cereopsis novaehollandiae* Latham, 1801
Tadorninae *Chloephaga picta* (Gmelin, 1789), *C melanoptera* (Eyton, 1838), *C rubidiceps* Sclater, 1861, *C poliocephala* Sclater, 1857, *Alopochen aegyptiaca* (Linnaeus, 1766), *Tadorna tadorna* (Linnaeus, 1758), *T tadornoides* (Jardine et Selby, 1828), *T ferruginea* (Pallas, 1764), *T variegata* (Gmelin, 1789), *Tachyeres pteneres* (Forster, 1844) (2)
Anatinae *Plectropterus gambensis* (Linnaeus, 1766), *Cairina moschata* (Linnaeus, 1758), *Nettapus coromandelianus* (Gmelin, 1789) *Calonetta leucophrys* (Vieillot, 1816), *Aix sponsa* (Linnaeus, 1758) (3), *A galericulata* (Linnaeus, 1758) (2), *Chenonetta jubata* (Latham, 1801), *Anas platyrhynchos* Linnaeus, 1758 (4), *A poecilorhyncha* Forster, 1781 (2), *A crecca* Linnaeus, 1758 (2), *A americana* Gmelin, 1789, *A strepera* Linnaeus, 1758, *A querquedula* Linnaeus, 1758 (2), *A undulata* Dubois, 1837 (2), *A formosa* Georgi, 1775, *A acuta* Linnaeus, 1758, *A bahamensis* Linnaeus, 1758, *A clypeata* Linnaeus, 1758, *A falcata* Georgi, 1775 (2), *A discors* Linnaeus, 1766, *A rhynchotis* Latham, 1801, *A* (*Salvadorina*) *waigiuensis* Rotschild et Hartert, 1894, *A* (*Lophonetta*) *specularioides* King, 1828, *Marmaronetta angustirostris* (Menetries, 1832), *Netta rufina* (Pallas, 1773) (3), *N peposaca* (Vieillot, 1816), *Aythya valisineria* (Wilson, 1814) (2), *A fuligula* (Linnaeus, 1758) (4), *A collaris* (Donovan, 1838) (2), *A ferina* (Linnaeus, 1758), *A baeri* (Radde, 1863), *A affinis* (Eyton, 1838) (2), *A americana* (Eyton, 1838), *A marila* (Linnaeus, 1761), *A nyroca* (Gueldenstaedt, 1770)
Merginae *Somateria spectabilis* (Linnaeus, 1758) (2), *Polysticta stelleri* (Pallas, 1769), *Histrionicus histrionicus* (Linnaeus, 1758), *Clangula hyemalis* (Linnaeus, 1758) (2), *Melanitta nigra* (Linnaeus, 1758) (2), *M perspicillata* (Linnaeus, 1758), *Bucephala clangula* (Linnaeus, 1758), *B albeola* (Linnaeus, 1758), *Mergus cucullatus* Linnaeus, 1758, *M albellus* Linnaeus, 1758 (2), *M serrator* Linnaeus, 1758, *M merganser* Linnaeus, 1758
Oxyurinae *Oxyura jamaicensis* Gmelin, 1789, *Biziura lobata* (Shaw, 1796) (2)

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New taxa, new combinations and current taxonomic status of tribes and genera of Psammodiinae (Coleoptera: Scarabaeoidea: Aphodiidae)

Miloslav RAKOVIČ[1)] & David KRÁL[2)]

[1)]Institute of Biophysics, Charles University, Salmovská 3, CZ–120 00 Praha 2, Czech Republic
[2)]Department of Zoology, Charles University, Viničná 7, CZ–128 44 Praha 2, Czech Republic

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Abstract The following new taxa and new combinations are proposed: Phycochini – trib. n.; *Messyrhus* gen. n. for *M. brachypterus* sp. n. (China: province Qinghai), *Neotrichiorhyssemus* gen. n. for *N. babaulti* (Bénard, 1917) comb. n., *N. balthasari* (Rakovič, 1987) comb. n., *N. bonnensis* (Nakane, 1960) comb. n., *N. esakii* (Nomura, 1943) comb. n., *N. expansicollis* (Bénard, 1930) comb. n., *N. hauseri* (Balthasar, 1933) comb. n., *N. hegeri* (Petrovitz, 1968) comb. n., *N. hirsutus* (Clouet, 1961) comb. n., *N. klapaleki* (Balthasar, 1963) comb. n., *N. malabaricus* (Balthasar, 1963) comb. n., *N. malkini* (Rakovič, 1987) comb. n., *N. matthewsi* (Rakovič, 1987) comb. n., *N. setiventris* (Petrovitz, 1968) comb. n., *N. umbilicatus* (Petrovitz, 1968) comb. n., *Pittinius* gen. n. for *P. omnisetosus* sp. n. (Nepal, India: Uttar Pradesh); *Rhyssemus murghabensis* (Balthasar, 1967) comb. n. (transferred from *Myrhessus* Balthasar, 1955). Keys to tribes and genera of the subfamily Psammodiinae are presented. Brachyptery in Psammodiinae is briefly discussed.

Taxonomy, new taxa, new combinations, key, brachyptery, Coleoptera, Scarabaeoidea, Aphodiidae, Phycochini trib. n., *Messyrhus brachypterus* gen. n. et sp. n., *Neotrichiorhyssemus* gen. n., *Pittinius omnisetosus* gen. n. et sp. n., *Rhyssemus*, world-wide fauna

INTRODUCTION

A considerable recent progress in the investigation of the subfamily can be documented by the fact that 10 new genera out of the total 24 so far described were established in the course of the last 20 years as can be seen in the catalogue by Dellacasa (1988a) and in two more recent original works by Gordon & Pittino (1992) and Stebnicka (1994).

On the other hand, in synthetic works appearing during the last two decades, either only certain groups of genera or only certain zoogeographical regions are considered – e. g. Gordon & Cartwright (1980), Rakovič (1981a, b), Pittino & Mariani (1986), Rakovič (1986), and Gordon & Pittino (1992). Thus, with respect to the development outlined above, as well as to the present introduction of new taxa, we will try to summarize the present taxonomic status of the subfamily Psammodiinae in the form of keys to tribes and genera on the world basis, which could be helpful for practical purposes.

We have recently received specimens of two new species and genera of the subfamily Psammodiinae. Their description is presented below. We also propose certain changes at the generic and tribal level.

MATERIAL AND METHODS

The following codes identify the collections housing the material examined in the text

DKCP – Czech Republic, Praha, David Kral collection,
JRCP – Czech Republic, Poděbrady, Jiří Rejsek collection,
MRCD – Czech Republic, Dobřichovice, Miloslav Rakovič collection,
NMPC – Czech Republic, Praha, National Museum (Natural History) collection (J Jelinek),
RCCP – Czech Republic, Praha, Radek Červenka collection,
RPCM – Italy, Milano, Riccardo Pittino collection

Specimens of the newly described species are provided with one red label [Name of a taxon] gen n , sp n , HOLOTYPUS or PARATYPUS [p] with No [sex mark][h], Miloslav Rakovič & David Král det 1997 [p] Exact label data are cited for the types Author's remarks and complementations are found in square brackets, [p] – preceding data are printed, [h] the same but handwritten

NEW TAXA AND NEW COMBINATIONS

Phycochini trib. n.

(Fig 7)

TYPE GENUS *Phycochus* Broun, 1886 770

The Australian monotypic genus *Phycochus* (with the species *P granıceps* Broun, 1886) is, however, distinctly different from all the other genera due to the presence of the following characters (for material examined see Rakovič 1981)

- superior and inferior apical spurs of metatibiae of equal lengths,
- outer surface of metatibia bearing considerable tooth-like tubercles, not arranged in longitudinal rows (Fig 7),
- unusually short metasternum,
- acute angle between metatibia lower margin and apical margin well observable in the view of metatatibia outer surface (Fig 7),
- unusually long trochanters,
- elytral striae rather indistinct

Within about 400 currently known species of Psammodiinae, four of the above characters occur only in the genus *Phycochus* Only the species *Geopsammodius hydropicus* (Horn, 1887) exerts a certain similarity in two characters (short metasternum and longer trochanters), which is probably a matter of convergency

This combination of characters suggests that the genus probably belongs to a separate phyletic line and thus, the new tribe Phycochini is proposed here

The difficult problem of the tribal classification of Psammodiinae has been successfully solved by Pittino & Mariani (1986) Based on their action, the tribes Psammodiini and Rhyssemini are currently recognized Both tribes include genera with complete as well as reduced pronotal structure We believe that the complete pronotal structure was probably developed (or perhaps reduced) during the phylogeny independently in different groups

Messyrhus gen. n.
(Figs 13–16)

TYPE SPECIES *Messyrhus brachypterus* sp. n.

DIAGNOSIS. Body slender, elytra very slightly broader behind (Fig. 13). Eyes small, visible in dorsal aspect. Clypeus obtusely dentate each side of anterior emargination. Frontoclypeal suture absent. Head vertex without oblique ridges arranged in chevron (Fig. 14). Pronotal structure almost missing, consisting only of vestigial transverse furrows and posterior longitudinal furrow. Setae along lateral and basal pronotal margins druseform (Figs 15, 16). Scutellum visible, small, triangulate. Humerus denticulate, humeral umbone absent. Elytral intervals almost flat, with very slightly expressed granules. Elytral striae with short spinlike setae. Brachypterous, elytra not coalescent. Metasternum of usual length, not shortened; metasternal plate glabrous, without punctures. Mesocoxae scarcely separated by metasternum. Femora slender, profemur as wide as metafemur. External surface of metatibia with distinct teeth arranged in two longitudinal rows. *Protibia considerably widend (Fig. 13). Metatibia slender, only slightly expanded* apically. Angle between metatibia lower and apical margins almost right. Terminal spurs of metatibia slender, not foliaceous. Superior terminal spur of metatibia much longer than inferior terminal spur and equal in length to tarsomeres I and II combined. Basimetatarsomere moderately, however, yet distinctly, symmetrically widened apically. Last abdominal sternite withous transverse impression.

DIFFERENTIAL DIAGNOSIS. The genus can be separated from the other genera of the subfamily Psammodiinae, tribe Rhyssemini based on the key to genera presented below. It is probably most closely allied to the genus *Rhyssemodes*, particularly due to the length of the upper terminal spur of the metatibia, shape of the basimetatarsomere and presence of two rows of teeth on the metatibia external surface. The genus *Messyrhus* gen. n. is, however, distinctively different *from Rhyssemodes due to the absence of oblique ridges on the head vertex and to its reduced* pronotal structure.

DISTRIBUTION. Qinghai province (China).

NAME DERIVATION. *Messyrhus* is an anagram of the generic name *Rhyssemus*; masculinum in gender.

Messyrhus brachypterus sp. n.
(Figs 12–15)

TYPE MATERIAL. Holotype and 9 paratypes Nos 1–9 (all females), labelled: "Ch [= China] – S Qinghai, ca 3300 m, 32°16'N 96°29'E, 5–6/7.1995, 20 km N NANQEN, cultural steppe", paratype No 10 (female), labelled: "China – SE Qinghai, road Toramarkog – Nanqên, 30 km N Nanqên, ca 3500 m, 24.6.1995". Holotype and paratypes 1–5 in DKCP, Nos 6–7 in MRCD, No 8 in RCCP, No 9 in RPCM, and No 10 in JRCP.

DESCRIPTION. Body elongate oval, convex (Fig. 13). Colour blackish except for reddish brown clypeal margins, anterior pronotal margin, anterior pronotal angles, head appendages and legs. Dorsal surface shagreened, moderately shiny.

Body length 2.7–2.9 mm.

Head (Fig. 14) distinctly convex. Clypeus medially strongly elevated, with anterior margin deeply emarginate between dentate angles; lateral margin very broadly rounded, only shallowly separated from genae. Genae rounded, distinctly exceeding eyes laterally, with several, relatively long setae. Eyes small, visible in dorsal aspect. Clypeal surface granulate, granules rounded or slightly transversal, becoming gradually larger in size posteriorly; discally each granule bear-

ing very short seta Posterior part of head without pair of oblique ridges, but with irregular horseshoe-shaped impressions and posteriorly simply, finely punctate

Pronotum (Fig 15) transversal, length-to-width ratio 1 1 45, with only two vestigial transverse ridges formed only by irregular, smoother and rather shiny areas, with only one pair of subobsolete transverse furrows Posterior longitudinal furrow only very slightly expressed Anterior angles almost rectangular Lateral margin broadly rounded, slightly emarginate at rounded posterior angles, distinctly crenulate Basal margin distinctly bordered Lateral and basal margins with row of druseform setae (Fig 16) Surface covered with irregularly spaced and rather irregularly sized, relatively large, shallow punctures, arranged in irregular, approximately transversal rows Punctures with irregularly crenulate margin, most of them bearing short spinlike seta Discally and anteriorly, some punctures smaller, horseshoe-shaped Areas between these "rows" with several smaller, irregularly spaced and irregularly shaped punctures

Scutellum small, almost triangulate

Elytra (Fig 13) only slightly dilated posteriorly, with small, sharply pointed humeral denticle Intervals moderately shiny, almost flat, with one row of very slightly expressed flat tubercles Striae distinct, alutaceous, with row of punctures crenating inner side of interval margins Most of punctures bearing short spinelike seta

Brachypterous, wing narrow, reduced, reaching approximately to 2/3 of elytron length

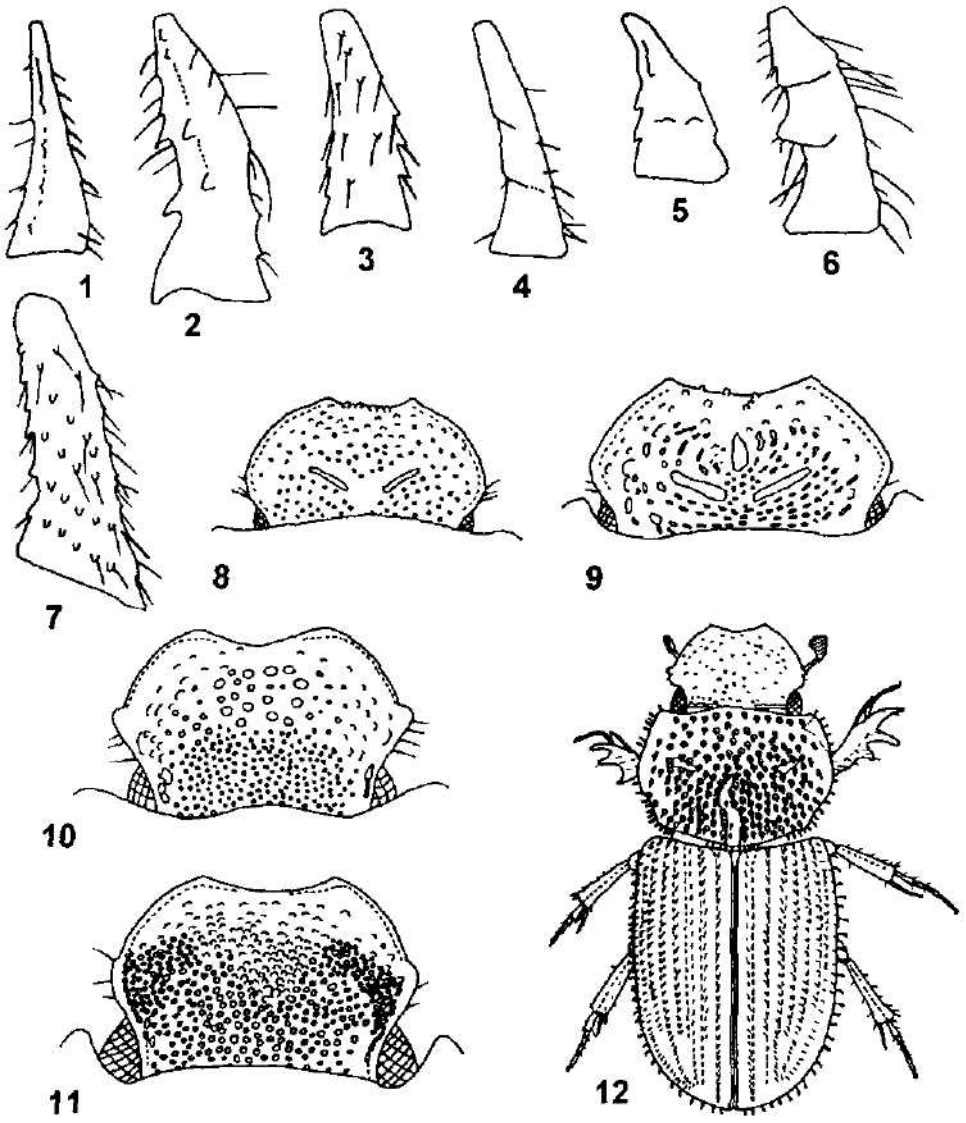
Metasternal plate with narrow, smooth zones along anterior and posterior margins Mesocoxae scarcely separated by metasternum Area between these zones with coarse (punctured and/or wrinkled) structure and with deep longitudinal impression Femora slender, shagreened, alutaceous profemur as wide as smooth, shining meso- and metafemur Meso- and metafemur along anterior and posterior margins with row of several long setae Protibia tridentate, unusually wide, continuously widened from base to apex (Fig 13) External surface of meso- and metatibia with distinct teeth arranged in two longitudinal rows Terminal spurs of meso- and metatibia slender, not foliaceous Superior terminal spur of mesotibia much longer than inferior terminal spur and scarcely longer than tarsomeres I and II combined Superior terminal spur of metatibia much longer than inferior terminal spur and equal in length to tarsomeres I and II combined Basimetatarsomere moderately, however, yet distinctly, symmetricaly widened apically Last abdominal sternite without transverse impression

Pygidium roughly scabrous, with four long apical setae

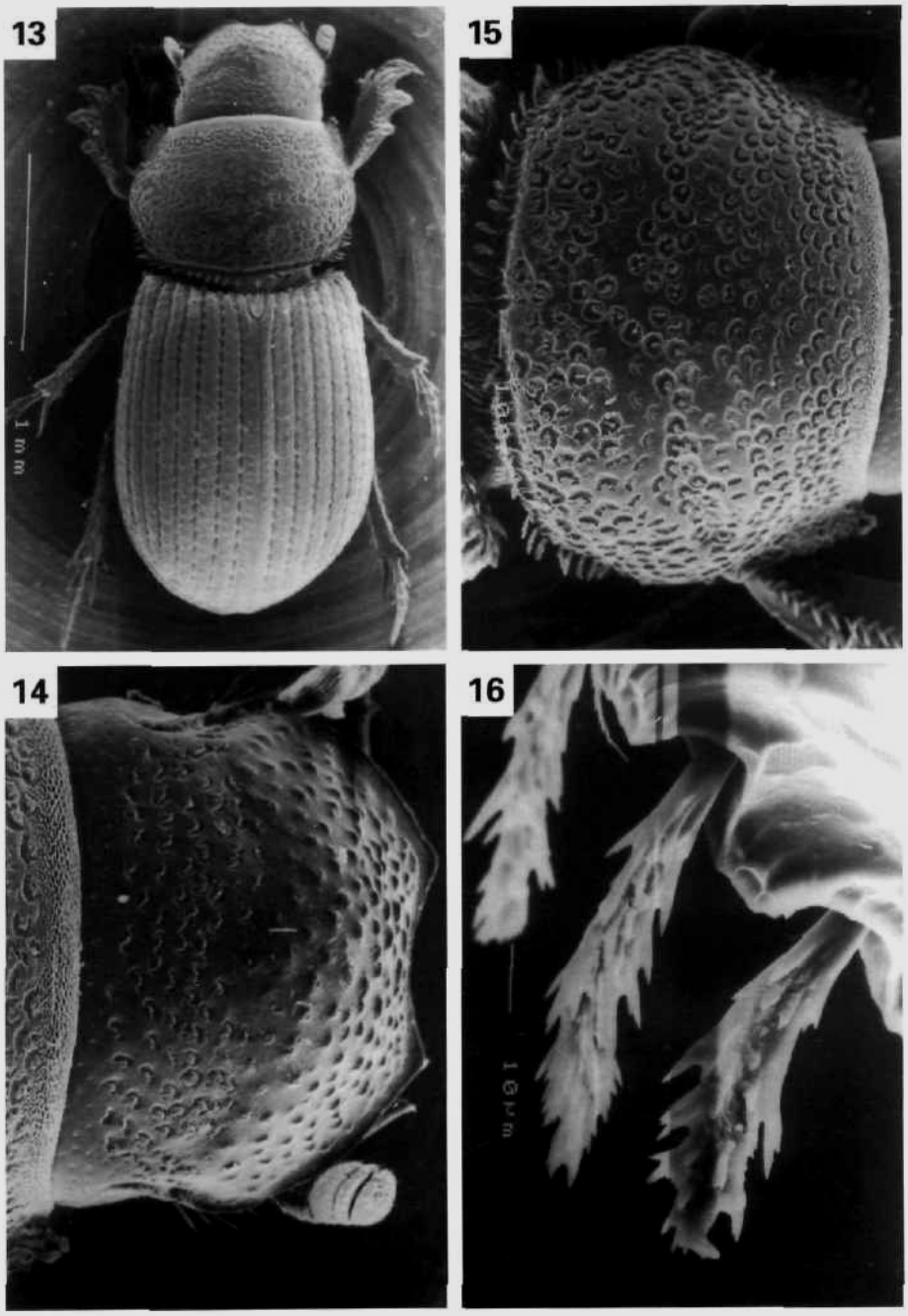
COLLECTION CIRCUMSTANCES All the type specimens except for paratype No 10 were collected from openings of marmot burrows They were buried in loess soil under droppings According to the available literature (Bibikov 1968, Hoffmann et al 1993) only a single marmot species, *Marmota himalayana* (Hodgson, 1841) (Mammalia Rodentia), is known to occur in the Qinghai province Paratype No 10 was taken from dry excrement of domestic yak (*Bos grunniens* Linnaeus, 1766)

NAME DERIVATION The specific name *brachypterus* denotes shortened wings of the new species

DISSCUSSION Different degrees of the wing reduction (from brachyptery to aptery) can be encountered in all the tribes of the subfamily Psammodinae, at least of some representatives of certain genera (as e g in the genera *Afrodiastictus*, *Brindalus*, *Geopsammodius*, *Phycochus*, *Psammodius*, *Psammorpha*, *Rhyssemus*, *Tesarius*) This probably originates through the adaption to extremely windy conditions of certain biotopes (sea coasts, deserts, Alpine plateaus, etc) This adaption reduces the vagility of the species and thus also a possibility of driving with wind to the other, unsuitable habitat This concept is also supported by the fact that brachypterous to apterous Psammodinae are tighly related to their habitats and they can hardly survive at different sites The cases known up to the present time within this group were probably developed



Figs 1–12 1–7 – right metatibia, dorsolateral aspect; 8–11 – head, dorsal aspect, 12 – *Pittinus omnisetosus* gen n et sp n habitus of holotype, dorsal aspect 1 – *Rhyssemodes orientalis* (Mulsant et Godart, 1874), 2 – *Geopsammodius hydropicus* (Horn, 1887), 3 – *Granulopsammodius plicatulus* (Fairmaire, 1892), 4 – *Amphodopsammobius zietzi* (Blackburn, 1895), 5 – *Sicardia psammodiformis* Reitter, 1896, 6 – *Tesarius sulcipennis* (Lea, 1904), 7 – *Phycochus granuceps* Broun, 1886, 8 – *Trichiorhyssemus riparius* (Horn, 1871), 9 – *T congolanus* (Clouet, 1901), 10 – *Neotrichiorhyssemus hirsutus* (Clouet) comb. n , 11 – *N balthasari* (Rakovič) comb n



Figs 13–16. *Messyrhus brachypterus* gen. n. et sp. n. – holotype, dorsal aspect. 13 – habitus, 14 – head, 15 – pronotum, 16 – posterolateral margin of pronotum with druseform setae.

independently of relations between particular taxa and thus, the brachypetry to aptery is most probably of no phylogenic importance.

Neotrichiorhyssemus gen. n.
(Figs 10, 11)

TYPE SPECIES. *Trichiorhyssemus hirsutus* Clouët, 1901 (by present designation).

DIAGNOSIS. Small (2.3 to 4.5 mm), rather matte, dark brown to black species, oblong oval, only slightly broader behind. Head strongly convex, granulate, head surface with more or less densely distributed setae. Eyes small, visible in dorsal aspect. Clypeus emarginate anteriorly, moderately or angularly rounded each side of emargination. Gena slightly protruding, with few acute setae. Head vertex uniformly granulate, without oblique ridges and without any trace of arranging granules in formations reminding of oblique ridges (Figs 10, 11). Pronotum with five transverse ridges, five transverse furrows and a posterior longitudinal furrow. Pronotal lateral and basal margins with more or less apically dilated setae. Pronotal surface with short setae situated in depressed areas (furrows, lateral impressions). Scutellum visible, small, triangulate.

Elytron with ten striae and ten intervals. Regular rows of setae along medial margins of intervals; few individual setae along lateral margins of intervals can also occur. Macropterous. Superior terminal spur of metatibiae longer than or as long as first metatarsomeres.Ventral surface also dark. Considerable longitudinal wrinkles along anterior margins of abdominal sternites. Metasternal plate mostly coarsely punctate.

NAME DERIVATION. Adding prefix "neo" in front of generic name *Trichiorhyssemus*; masculinum in gender.

DISCUSSION OF THE PRESENT PROPOSAL. Psammodiinae are characterized by strongly convex, granulate head and by their typical, either complete or reduced pronotal structure. The complete structure is formed by five transverse ridges and five transverse furrows, at least the fourth and fifth ridges are medially interrupted by a posterior longitudinal furrow. Between the fourth and fifth ridges, there is sometimes an accessory transverse swelling each side of the posterior longitudinal furrow. The reduced pronotal structure consists of more or less distinct two pairs of lateral impressions (corresponding to ends of the first and third transverse furrows), posterior longitudinal furrow and sometimes also rows of coarse punctures corresponding to vestigial parts of some of the transverse furrows.

Within the subfamily Psammodiinae, which includes over 400 species (Dellacasa 1988a), in species with the complete pronotal structure, there are mostly one or two pairs of oblique ridges on the head vertex arranged in a chevron, whereas in those with the reduced pronotal structure, these oblique ridges are lacking. There are few exceptions concerning three genera out of the currently known 27 genera that fall into the subfamily Psammodiinae.

The first two cases concern species from the western hemisphere with the complete pronotal structure and with the absence of the oblique ridges on the head vertex, which were thus recently separated from the genera *Psammodius* and *Rhyssemus* to be included into newly established genera *Neopsammodius* and *Neorhyssemus* (Rakovič 1986, and Gordon & Pittino 1992, respectively). The third problem, which has not yet been solved, concerns the genus *Trichiorhyssemus*, which currently includes 34 species – all with the complete pronotal structure, some of them bearing oblique ridges on the head vertex and some others missing these ridges (see e. g. Figs 8, 9 and 10, 11, respectively). Thus, for saving the consistency of the system within the subfamily Psammodiinae, the separation is proposed of the later 14 species from the genus *Trichiorhysse-*

mus with establishing the new genus *Neotrichiorhyssemus* to include (for material examined see Rakovič 1983, 1987)

Neotrichiorhyssemus babaulti (Bénard, 1917) comb. n.

Trichiorhyssemus babaulti Benard, 1917 167, Balthasar, 1964 593 (revision), Rakovič, 1987 3 (revision), Dellacasa, 1988a 424 (catalogue)

DISTRIBUTION India

Neotrichiorhyssemus balthasari (Rakovič, 1987) comb. n.
(Fig 11)

Trichiorhyssemus balthasari Rakovič, 1987 11, Dellacasa, 1988a 424 (catalogue)

DISTRIBUTION SW India

Neotrichiorhyssemus boninensis (Nakane, 1960) comb. n.

Trichiorhyssemus boninensis Nakane, 1960 5, Balthasar, 1964 593 (revision), Rakovič, 1987 9 (revision), Dellacasa, 1988a 424 (catalogue)

DISTRIBUTION Bonin Islands

Neotrichiorhyssemus esakii (Nomura, 1943) comb. n.

Trichiorhyssemus esakii Nomura, 1943 30, Rakovič, 1983 14 (revision), Dellacasa, 1988a 424 (catalogue)

DISTRIBUTION Micronesia

Neotrichiorhyssemus expansicollis (Bénard, 1930) comb. n.

Trichiorhyssemus expansicollis Bénard 1930 632, Balthasar 1964 593 (revision), Rakovič, 1987 7, Dellacasa, 1988a 424
Rhyssemus (Trichiorhyssemus) expansicollis Pittino, 1984 85

DISTRIBUTION S India

Neotrichiorhyssemus hauseri (Balthasar, 1933) comb. n.

Trichiorhyssemus hauseri Balthasar, 1933 117, Balthasar, 1964 592 (revision), Rakovič, 1987 4 (revision), Dellacasa, 1988a 424 (catalogue)

DISTRIBUTION Kalimantan

Neotrichiorhyssemus hegeri (Petrovitz, 1968) comb. n.

Trichiorhyssemus hegeri Petrovitz, 1968 8, Rakovič, 1987 3 (revision), Dellacasa, 1988a 424 (catalogue)

DISTRIBUTION Sri Lanka

Neotrichiohyssemus hirsutus (Clouët, 1901) comb. n.
(Fig. 10)

Trichiorhyssemus hirsutus Clouët, 1901: 35; Schmidt, 1922: 521 (revision), Balthasar, 1963: 138 (key), 1964: 592 (revision); Rakovič, 1983: 11 (revision); Rakovič, 1987: 6 (revision), Dellacasa, 1988a: 424 (catalogue)
Trichiorhyssemus cariei Bénard, 1918: 542 (syn. by Schmidt, 1922: 521)
Trichiorhyssemus samoanus Balthasar, 1963: 139 (syn. by Rakovič, 1987: 6).
Trichiorhyssemus samoanus. Rakovič, 1983: 12 (revision)

DISTRIBUTION. SE Asia, New Guinea, Pacific Islands.

Neotrichiorhyssemus klapaleki (Balthasar, 1963) comb. n.

Trichiorhyssemus klapaleki Balthasar, 1963: 136; Balthasar, 1964: 590 (revision); Rakovič, 1987: 8 (revision); Dellacasa, 1988a: 424 (catalogue)

DISTRIBUTION. S India.

Neotrichiorhyssemus malabaricus (Balthasar, 1963) comb. n.

Trichiorhyssemus malabaricus Balthasar, 1963: 137, Balthasar, 1964: 594 (revision), Rakovič, 1987: 8 (revision)
Trichiorhyssemus malabricus (! error) Dellacasa, 1988a: 424 (catalogue).

DISTRIBUTION. SW India.

Neotrichiorhyssemus malkini (Rakovič, 1987) comb. n.

Trichiorhyssemus malkini Rakovič, 1987: 10; Dellacasa, 1988a: 424 (catalogue).

DISTRIBUTION. New Hebrides.

Neotrichiorhyssemus matthewsi (Rakovič, 1987) comb. n.

Trichiorhyssemus matthewsi Rakovič, 1983: 13; Rakovič, 1987: 5 (revision); Dellacasa, 1988a: 424 (catalogue)

DISTRIBUTION. Timor.

Neotrichiorhyssemus setiventris (Petrovitz, 1968) comb. n.

Trichiorhyssemus setiventris Petrovitz, 1968: 10; Rakovič, 1987: 9 (revision), Dellacasa, 1988a: 424 (catalogue).

DISTRIBUTION. SW India.

Neotrichiorhyssemus umbilicatus (Petrovitz, 1968) comb. n

Trichiorhyssemus umbilicatus Petrovitz, 1968: 11; Rakovič, 1987: 3 (revision); Dellacasa, 1988a: 424.

DISTRIBUTION. Sumbawa.

We do not intend to discuss the status of the species left in the genus *Trichiorhyssemus* but we tend to accept a suggestion by Pittino (1984) that *Trichiorhyssemus* can possibly be only a subgenus of the genus *Rhyssemus*. It is even possible that e. g. species with various types of elytral intervals will fall into different subgenera, however, this action could be possible only

within the scope of a revision of the whole genus *Rhyssemus*, which is beyond the scope of the present communication

It is of interest that species of the genus *Neotrichiorhyssemus* gen n prevalently occur in Asia, Australia and Pacific Islands, whereas most species left in the genus *Trichiorhyssemus* occur in Europe, Africa and Western hemisphere (Fig 17)

Pittinius gen. n.

(Fig 12)

TYPE SPECIES *Pittinius omnisetosus* sp n

DIAGNOSIS Body slender, elytra almost parallel Whole dorsal surface distinctly setaceous, setae at least in pronotum and elytra probably clavate Eyes well developed, visible in dorsal aspect Clypeus sharply dentate each side of anterior emargination Frontoclypeal suture absent Head vertex without pair of oblique ridges arranged in chevron Pronotum without trace of transversal ridges and furrows, covered densely with large shallow umbilicate punctures bearing short clavate setae Setae along slightly crenate lateral and basal pronotal margin clavate Scutellum visible, small, triangulate Humerus without denticle, humeral umbone present Elytral intervals flat, with slightly expressed row of granules Granules bearing short, clavate setae Elytral striae narrow, deeply expressed Metathoracic wings functional Metasternum of usual length (not shortened), metasternal plate flat, bearing several short setae Mesocoxae scarcely separated by metasternum Femora slender, profemur as wide as metafemur External surface of metatibia with distinct teeth arranged in two longitudinal rows Metatibia slender, only slightly expanded apically Angle between metatibia lower and apical margins almost right Terminal spurs of metatibia slender, not foliaceous Superior terminal spur of metatibia much longer than inferior terminal spur and equal in length to tarsomeres I and II combined Basitarsomere moderately, however, yet distinctly, symmetricaly widened apically Last abdominal sternite without transversal impression

DIFFERENTIAL DIAGNOSIS For the differential diagnosis see the complex of diagnostic characters in the keys to tribes of the subfamily Psammodiinae (page 244) and to genera of the tribe Rhyssemini (page 245) It is probably most closely related to the genus *Mysarus*, particularly due to setaceous dorsal surface and reduced pronotal structure

DISTRIBUTIN Nepal, India Uttar Pradesh

NAME DERIVATION The name of the genus was chosen in recognition of outstanding contributions of Dr Riccardo Pittino (Milan, Italy) to knowledge of the subfamily Psammodiinae and of some other groups of Aphodiidae, masculinum in gender

Pittinius omnisetosus sp. n.

(Fig 16)

TYPE MATERIAL Holotype (female), labelled 'Nepal, 22 –26 5 1990, Chitvan N P [= National Park], S Bily leg [p] / at light [h] ', deposited in DKCP Paratype No 1 (female), labelled "N India Uttar Pradesh 450 m Rishi Kesh VIII [19]88 [K] Werner [lgt] [h]", deposited in RPCM

Description Body elongate, oval, moderately convex (Fig 16) Dark brown, antennae yellowish brown, legs and anterior clypeal margin reddish brown Dorsal surface slightly shiny to matte

Body length 2 5 mm

Head convex, with small, rather uniformely distributed granules, without posterior oblique ridges Granules equipped (at posterior part of their circumference) with very short, erect setae

well perceptible in lateral aspect, hardly perceptible in dorsal aspect. Anterior clypeal margin with sharp, elevated angle each side of emargination. Genae small, of nearly semicircular shape, with few fine, minute setae. Eyes large.

Pronotum transversal, length-to-width ratio 1:1.40, shagreened, matte, with large, umbilicate punctures bearing short, semierect, clavate setae, considerably larger than setae on head. Impressions and/or areas free of punctures at sides corresponding to posterior longitudinal furrow and lateral vestigial parts of third transverse furrow (occurring in Psammodiinae with complete pronotal structure). Basal pronotal margin, crenate lateral margins and posterior corners with larger, clavate setae.

Elytra subparallel, length-to-width ratio 1:0.74, with ten striae and ten intervals. Striae very distinct, in form of grooves. Intervals flat, bearing rows of small granules, situated rather laterally than medially in each interval. Granules equipped (at posterior part of their circumference)

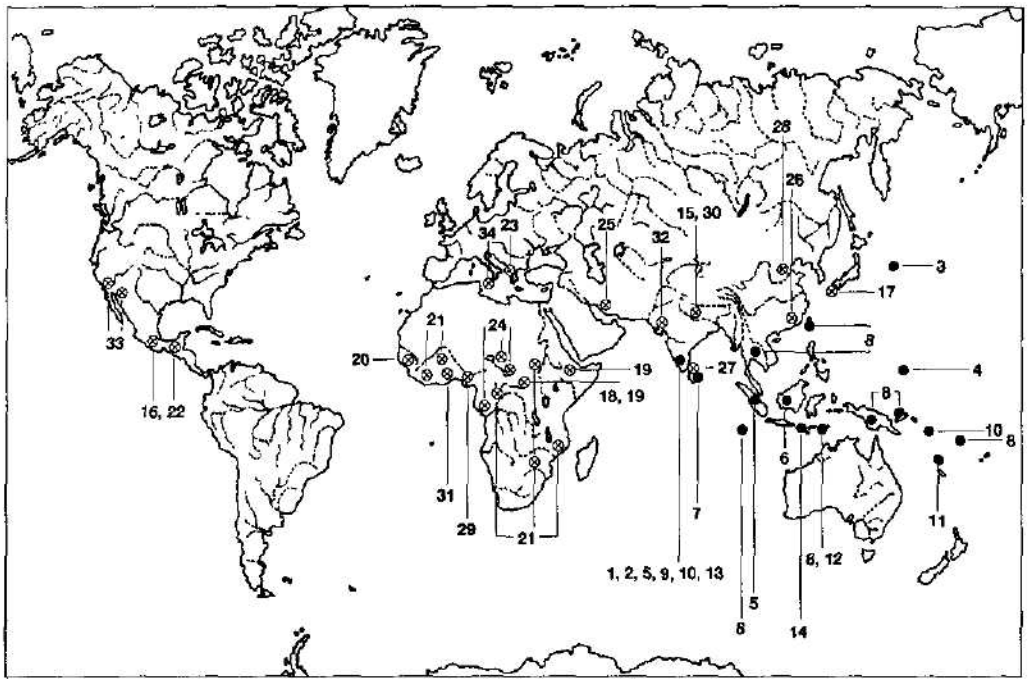


Fig 17 Distribution of species of the genera *Neotrichorhyssemus* gen n and *Trichiorhyssemus* Clouet 1 – *Neotrichiorhyssemus babaulti* (Bénard) comb n , 2 – *N balthasari* (Rakovič) comb. n , 3 – *N bonnensis* (Nakane) comb. n , 4 – *N. esakii* (Nomura) comb n., 5 - *N expansicollis* (Bénard) comb. n , 6 – *N hauseri* (Balthasar) comb n , 7 – *N hegeri* (Petrovitz) comb n , 8 – *N. hirsutus* (Clouet) comb. n., 9 – *N klapaleki* (Balthasar) comb n., 10 – *N. malabaricus* (Balthasar) comb. n., 11 – *N malkini* (Rakovič) comb. n , 12 – *N. matthewsi* (Rakovič) comb n , 13 – *N setiventris* (Petrovitz) comb. n , 14 – *N. umbilicatus* (Petrovitz) comb n , 15 – *Trichiorhyssemus adhabharicus* (Pittino, 1983), 16 – *T. alternatus* (Hinton, 1938), 17 – *T asperulus* (Waterhouse, 1875), 18 – *T bicolor* (Clouet, 1901), 19 – *T. bisigillatus* (Bénard, 1924), 20 – *T clouetı* W Koshantschikov, 1916, 21 – *T congolanus* (Clouet, 1901), 22 – *T cristatellus* (Bates, 1887), 23 – *T dalmatinus* Petrovitz, 1967, 24 – *T decorsei* Bénard, 1914, 25 – *T elegans* (Petrovitz, 1963), 26 – *T foktensis* Petrovitz, 1968, 27 – *T fruhstorferi* Petrovitz, 1968, 28 – *T. lasionotus* Clouet, 1901, 29 – *T. longetarsalis* Bénard, 1921, 30 – *T. nepalensis* (Pittino, 1983), 31 – *T occidentalis* (Endrödi, 1976), 32 – *T pseudoinscitus* (Pittino, 1984), 33 – *T riparius* (Horn, 1871), 34 – *T setulosus* (Reitter, 1892).

with semierect, clavate setae, similar to those on pronotum. Odd intervals (sutural interval inclusive) mostly complete, nearly achieving elytral apex; even intervals mostly shortened posteriorly.

Metasternal plate centrally concave and smooth, marginally flat and bearing several short, semierect seate; longitudinal line shortened anteriorly and posteriorly. All femora shiny, bearing numerous short, semierect setae; slender, profemur as wide as meso- or metafemur. Protibia tridentate. Meso- and metatibia slender, only slightly expanded apically. Angle between metatibia lower and apical margins almost right. Terminal spurs of metatibia slender, not foliaceous. Superior terminal spur of metatibia much longer than inferior terminal spur and equal in length to tarsomeres I and II combined. Basimetatarsomere moderately, however, yet distinctly, symmetricaly widened apically. Abdominal sternites scabrous, with rows of very short, spinlike setae. Last abdominal sternite without transversal impression.

COLLECTION CIRCUMSATNCES. Both the type specimens were collected at light.

NAME DERIVATION. The specific name *omnisetosus* denotes that all surface od the new species is setaceous.

Rhyssemus murghabensis (Balthasar, 1967) comb. n.

Myrhessus murghabensis Balthasar, 1967; Dellacasa, 1988a: 420 (catalogue)

The genus *Myrhessus* has been considered till now to include the following species: *M. afghanus* Balthasar, 1939, *M. mirabilis* Balthasar, 1955, *M. samurai* Balthasar, 1941, and *M. murghabensis*.

All the relevant Balthasar's holotypes kept in the NMPC were examined during the preparation of present keys to genera and it was found that the first three species have a characteristic pronotal structure as follows: uniform granulate area instead of first to third transverse ridges; deep furrow behind this area; granulate area behind this deep furrow, again (instead of fourth and fifth ridges), medially interrupted by deep posterior longitudinal furrow.

On the other hand, the fourth species has five (though if flat and granulate) pronotal ridges and thus, the new combination is proposed here.

SUMMARIZATION OF TRIBES AND GENERA

The differences between characters of the two principal tribes of the subfamily were perfectly characterized by Pittino & Mariani (1986). The keys below are presented to include the new tribe and genera proposed here with respecting the concept of these authors.

Key to tribes of the subfamily Psammodiinae

1 (4) Superior terminal spur of metatibia much longer than inferior terminal spur. External surface of metatibia with heavy (nearly transverse) carinae (Fig. 6), vestigial ridges (Figs 4, 5) or more or less distinct teeth arranged in longitudinal row (Figs 1, 2) or two rows (Fig. 3). Metasternum of usual length except for species *Geopsammodius hydropicus*. Nearly right angle between metatibia lower and apical margins (Figs 1–6)

2 (3) Mostly plumper animals, elytra mostly considerably broader behind. Profemur narrower than metafemur. Basimetatarsomere considerably, asymmetrically widened apically . . . . . Psammodiini

3 (2) Mostly slender animals, elytra parallel, subparallel, at most moderately broader behind. Profemur as wide as or wider than metafemur. Basimetatarsomere elongate, subcylindrical, only slightly to moderately, symmetrically widened apically . . . . . Rhyssemini

4 (1) Superior and inferior terminal spurs of equal lengths. Outer surface of metatibia with considerable toothlike granules, not arranged in longitudinal rows (Fig. 7). Metasternum unusually short. Considerably acute angle between metatibia lower and apical margins (Fig. 7). . . . . Phycochini **trib. n.**

Key to genera of the tribe Psammodiini

1 (10) Genera with complete pronotal structure (five transverse ridges and five transverse furrows)
2 (3) Elytral intervals costate ..... *Petrovitzius* Rakovič, 1979
3 (2) Elytral intervals either flat or convex, however, never costate.
4 (7) Elytral intervals either partially or completely granulate
5 (6) Setae along pronotum lateral margins acuminate apically, posterior wings normally developed, functional ..... *Granulopsammodius* Rakovič, 1981
6 (5) Setae along pronotum lateral margins dilated apically, posterior wings strongly reduced, elytra coalescent. ..... *Brindalus* Landin, 1960
7 (4) Elytral intervals never granulate.
8 (9) Head vertex with oblique ridges arranged in chevron ..... *Psammodius* Fallén, 1807
9 (8) Oblique ridges on head vertex absent. ..... *Neopsammodius* Rakovič, 1986
10 (1) Genera with reduced pronotal structure (lateral impressions corresponding to ends of first and third pronotal furrows, posterior longitudinal furrow and possibly also rows of coarse punctures along some vestigial parts of transverse furrows)
11 (12) Dorsal surface with long, hairlike setae. ..... *Trichiopsammobius* Petrovitz, 1963
12 (11) Dorsal surface glabrous
13 (18) Metatibia with either one or two nearly transverse vestigial ridges (Figs 4, 5) or with heavy carinae (Fig. 6).
14 (15) Claws setaceous. ..... *Sicardia* Reitter, 1896
15 (14) Claws hornlike.
16 (17) Metatibia with one or two vestigial ridges. ..... *Aphodopsammobius* Endrödi, 1964
17 (16) Metatibia with one or two heavy carinae ..... *Tesarius* Rakovič, 1981
18 (13) Metatibia with teeth arranged in longitudinal row (e. g. Fig. 2)
19 (20) Clypeus toothed each side of anterior emargination ..... *Odontopsammodius* Gordon & Pittino, 1992
20 (19) Clypeus rounded each side of anterior emargination
21 (22) Eyes very small, frontal suture absent ..... *Geopsammodius* Gordon & Pittino, 1992
22 (21) Eyes normally developed, frontal suture present.
23 (24) Pronotum surface with extremely coarse punctures throughout, metatibia slender – only apically widened. ..... *Diastictus* Mulsant, 1842
24 (23) Coarse punctures on pronotum surface (if present) arranged along vestiges of furrows, metatibia robust ..... *Letopsammodius* Rakovič, 1981

NOTE. *Ingogius* Endrödi, 1976 is a genus originally included by its author into Aphodiini, however, listed in the cataloque by Dellacasa (1988a) under Psammodiinae, tribe Psammodiini, based on its preliminary examination by Pittino (personnal communication by both G. Dellacasa and R. Pittino) We have not seen the type species and thus, we have not included the genus into the present key, however, based on the original description, it can be differentiated from other genera, inter alia, based on the fact that it is the only genus of Psammodiini with reduced pronotal structure and costate elytral intervals.

Key to genera of the tribe Rhyssemini

1 (14) Pronotal structure complete, formed by five transverse ridges and five transverse furrows (accessory swelling may be present between fourth and fifth ridges, each side of posterior longitudinal furrow).
2 (5) Dorsal surface with setae.
3 (4) Head vertex with oblique ridges (Figs 8, 9), metasternal plate mostly finely punctate. ..... *Trichiorhyssemus* Clouët, 1901
4 (3) Oblique ridges of head vertex absent (Figs 10, 11), metasternal plate mostly coarsely punctate. ..... *Neotrichiorhyssemus* **gen. n.**
5 (2) Dorsal surface glabrous
6 (7) Elytral intervals smooth, body strongly elongate, parallel. ..... *Pararhyssemus* Balthasar, 1955
7 (6) Elytral intervals either granulate or transversely wrinkled, body oblong oval, subparallel.
8 (13) Superior terminal spur or metatibia at most as long as, however, most typically shorter than basimetatarsomere.
9 (12) Head vertex with oblique ridges
10 (11) Last abdominal sternite with a deep transverse impression. ..... *Rhyssemus* Mulsant, 1842

11 (10) Transverse impression of last abdominal sternite absent ..... *Rhyssemorphus* Clouet, 1900
12 (9) Oblique ridges on head vertex absent ..... *Neorhyssemus* Gordon & Pittino, 1992
13 (8) Superior terminal spur of metatibia at least as long as the first and second tarsomeres combined. ..... *Rhyssemodes* Reitter, 1892
14 (1) Pronotal structure reduced, not formed by five transverse ridges.
15 (18) Dorsal surface with setae (Fig 12)
16 (17) Elytral intervals smooth ..... *Mysarus* Petrovitz, 1962
17 (16) Elytral intervals granulate. ..... *Pittinus* **gen. n.**
18 (15) Dorsal surface glabrous.
19 (20) Humerus bidenticulate. ..... *Psammorpha* Stebnicka, 1994
20 (19) Humerus either with one tooth or without tooth.
21 (22) Metatibia with pair of more or less distinct vestigial oblique ridges. ..... *Bordatus* Pittino & Mariani, 1986
22 (21) Metatibia without oblique ridges
23 (26) Principal dorsal surface area strongly shagreened, quite matte. Elytral intervals granulate
24 (25) Pronotum with large granules, with unusually deep transverse depression corresponding to third transvere furrow. Each elytral interval with row of large granules Superior terminal spur shorter than first and second metatarsomeres combined ..... *Myrhessus* Balthasar, 1955
25 (24) Pronotum non-granulate, with large horseshoe-shaped punctures, with shallow vestigial third transverse furrow (Fig 15). Each elytral interval with two rows of small grains (Fig. 13) Superior terminal spur longer than first and second metatarsomeres combined ..... *Messyrhus* **gen. n.**
26 (23) Principal dorsal surface shiny Elytral intervals non-granulate
27 (28) Elytral intervals costate. ..... *Afrodiastictus* Pittino & Mariani, 1986
28 (27) Elytral intervals either flat or convex, never costate.
29 (30) Body elongate, subparallel, rather flat mesofemur either as wide as or wider, than metafemur. ..... *Pleurophorus* Mulsant, 1842
30 (29) Body rather plumper, convex, mesofemur narrower than metafemur. ..... *Platytomus* Mulsant, 1842

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We are indebted to Dr Riccardo Pittino (Milano, Italy), who possessed one of the two type specimens and considered the description of the new genus in the future After being informed about our intention to describe the new genus, he friendly sent us his specimen to be included into our study Our thanks are also due to Dr Vladimir Vohralík (Charles University, Praha) for supplying literature concerning Chinese mammals, Dr Tomáš Scholz and the staff of the Laboratory of the Electron Microscopy (Institute of Parasitology, České Budějovice) for help with preparing the SCAN microphotographs, and Dipl. Ing Jaroslav Turna (Kostelec na Hané, Czech Republic) and all colleagues and institutions listed in Material and methods section for enabling us to study material in their charge.

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A new species of *Chalcogenia* from Israel, and notes on the systematic position of the genus (Coleoptera: Buprestidae: Anthaxiini)

Mark G. VOLKOVITSH[1)] & Svatopluk BÍLÝ[2)]

[1)]Zoological Institute, Russian Academy of Sciences, Universitetskaya nab. 1, RUS–199034 Sankt Petersburg, Russia
[2)]Department of Entomology, National Museum, Kunratice 1, CZ–148 00 Praha 4, Czech Republic

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Abstract A new species, *Chalcogenia halperini* sp. n. from Israel, is described, illustrated and compared with related species. Larva of *C. halperini* sp. n. is described in detail and compared with larvae of *Anthaxia* Eschscholtz, 1829; larval characteristics of Anthaxiini, Melanophilini and Kisanthobiini are given. Replacement of *Chalcogenia* Saunders, 1871 from Melanophilini to Anthaxiini is suggested on the base of both imaginal and larval characters and a key to African Anthaxiini is given.

Taxonomy, larval morphology, Coleoptera, Buprestidae, *Chalcogenia halperini* sp. n., Palaearctic region

INTRODUCTION

The occurrence of *Chalcogenia theryi* Abeille, 1897 developing on *Acacia* trees was reported for Israel and Sinai (Bytinski-Salz 1954, Mateu 1975). It was believed this species occupied the most northern part of the geographical range of *Chalcogenia* Saunders, 1871, distributed exclusively in Africa.

During collecting trips to Israel in 1994 and 1996 the entomological expeditions of the Zoological Institute of St. Petersburg collected some specimens and numerous fragments of this species in Negev and Dead Sea Area. The comparison of these specimens with those from Obenberger's collection (NMPC) and type of *C. theryi* (MNHN) has shown that Israeli specimens belongs to a new species which differs clearly from *C. theryi* being closely related to some South-African species. Later on, the authors obtained additional material of this species from Mr. Josef Halperin (TAUI) and from some private collections. Mr. J. Halperin has also kindly supplied the authors with the larvae of this new species found inside the branches of *Acacia* trees in Negev.

The following abbreviations are used in the text: GMCC – collection of Gianluca Magnani, Cesena, Italy, GSCC – collection of Gianfranco Sama, Cesena, Italy, JHIC – collection of Josef Halperin, Nes Zyona, Israel, MNAC – collection of Manfred Niehuis, Albersweiler, Germany, MNHN – Muséum national d'Histoire naturelle, Paris, France; NMPC – National Museum, Prague, Czech Republic; RLWE – collection of Richard L. Westcott, Salem, USA; SPBC – collection of Stanislav Prepsl, Brno, Czech Republic; TAUI – Department of Zoology Tel-Aviv University, Israel, VKBC – collection of Vít Kubáň, Brno, Czech Republic; ZMAS – Zoological Institute, St. Petersburg, Russia.

Chalcogenia halperini sp. n.
(Figs 1–24)

DESCRIPTION. Body large and robust, rather convex, distinctly cuneiform (Fig. 1); entire body metallic-bronze, tarsi, antennae and frons of male black with green-bronze lustre; underside

with small patches of white tomentum on proepisterns, pro-, meso- and metasternum and on abdominal sterna, pronotum and elytra asetose, frons with short but rather dense, white pubescence, vertex with nearly indistinct pubescence, ventral side and legs with moderately long and sparse, white pubescence, epimerons and laterosternites with very dense, white or cream-white pubescence

Head rather large, frons flat (Fig 1), vertex flat, 1 1–1 2 times as wide as width of eye, clypeus widely, triangularly incurved anteriorly, frontoclypeal suture completely missing, eyes very large and convex, slightly reniform but not projecting beyond outline of head, sculpture of head consisting of very small and dense, umbiliform punctures, space between them being smaller than the diameter of the punctures, antennae rather short, reaching mid-length of lateral pronotal margins, first antennal segment pear-shaped, 2 5 times as long as wide, second segment slightly longer than wide, enlarged apically, third segment sharply triangular, 1 5 times as long as wide, segments 4–10 enlarged, trapezoidal, wider than long, last segment regularly rhomboid, antennal sensory areas – see Figs 25–26

Pronotum moderately and regularly convex, 1 6–1 8 times as wide as long with small and shallow, nearly triangular laterobasal depressions, anterior pronotal margin very slightly lobate medially, posterior margin bisinuous (Fig 1), lateral pronotal margins somewhat angulately arched, nearly straight anteriorly and slightly incurved posteriorly, maximum pronotal width anteriorly of pronotal mid-length, pronotal sculpture consisting of fine and dense, simple punctures medially and dense, umbilicate punctures laterally (Fig 1), puncturation of laterobasal depressions sometimes slightly prolonged forming indistinct, longitudinal wrinkles, lateral pronotal carinae incomplete, slightly S-shaped, not reaching anterior pronotal angles Scutellum large, cordiform or slightly pentagonal, as wide as long, sharply pointed posteriorly

Elytra cuneiform, rather convex, 2 1–2 2 times as long as wide at humeral part (Fig 1), each elytron with four feeble, almost smooth, longitudinal carinae not reaching the very apex of elytra, humeral swellings small, basal, transverse elytral depressions well-developed reaching second elytral carina and divided by the prominent basis of the third carina, posterior third of elytral margins distinctly and sharply serrate, each elytron separately rounded apically, elytral epipleura narrow and shortened reaching only two thirds of elytral length, elytral sculpture consisting of very small and dense, umbilicate punctures which are transversely connected on lateral parts of elytra forming there short and fine, transverse wrinkles

Prosternum lustrous and nearly asetose medially, prosternal process slightly convex, somewhat enlarged behind coxae, sharply pointed posteriorly, with very fine and sparse, simple puncturation Abdominal sterna rather lustrous, sparsely and finely punctured with distinct medial, longitudinal groove which is reduced only to shallow, basal depression on the last two segments Besides of this groove, all sterna with a pair of small, shallow and rounded depressions on each side, these depressions are usually covered with white tomentum and they are rather indistinct on anal sternum Anal sternum sharply serrate laterally, apically with shallow, arched incurvation in male or deep, triangular notch and wide, smooth, medial carina in female Legs relatively short, all trochanters of male with short but rather sharp spine Metafemurs of male conspicuously swollen, pro- and mesotibiae slightly bent with inner serration and long, dense setae (Fig 1), male metatibiae slightly bent outwards, their inner margin with sharp, robust tooth at the basal third and several smaller teeth between basal tooth and apex of tibia, also with long, inner bristles (Fig 1) Tarsi somewhat enlarged, shorter than tibiae, tarsal segments 1–4 with well-developed adhesive pads Claws very slender, long and regularly arched, only very slightly enlarged at their base

Aedeagus (Figs 8, 9): rather long, flattened, parameres slightly angulate near their mid-length and sharply pointed apically; the median lobe of aedeagus simply and sharply pointed.

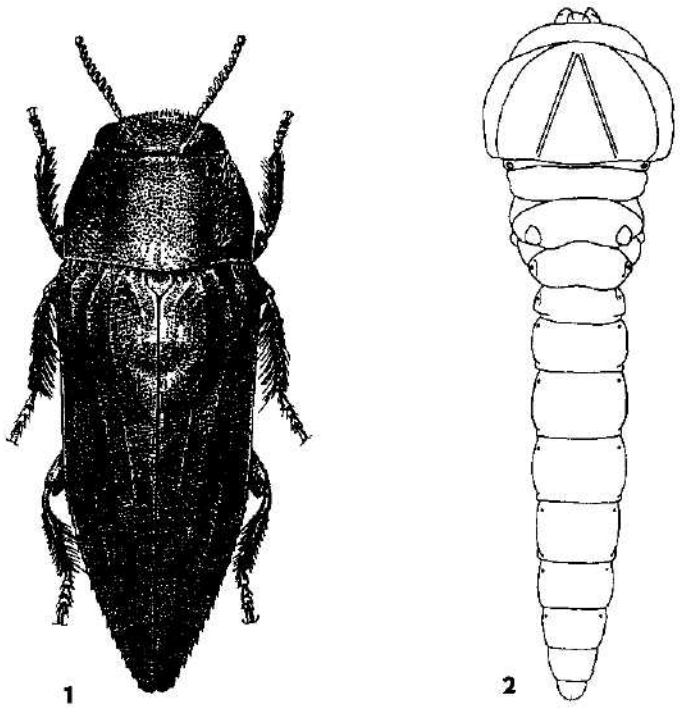
Ovipositor (Fig. 3): of tubular type, very long, approximately 5.3 times as long as enlarged part, with prominent median lobe between styli, bearing clusters of straight, short spines and basiconic sensillae at antero-lateral corners. Distal half of ovipositor covered with rather dense, straight and needle-like spines, distal margin of enlarged part with the line of basiconic sensillae. Hemisternites thin, slightly bent, with very long, narrow, strightly recurved branches, their apical sclerotization poorly developed.

LENGTH. 9.2–15.0 mm (holotype 10.0 mm); width: 3.5–5.5 mm (holotype 3.5 mm).

SEXUAL DIMORPHISM. Female differs from male by concolorous, bronze frons, narrower antennae, absence of spines on trochanters, not swollen metafemurs, simple, unmodified tibiae and by triangularly notched apex of anal sternum.

NAME DERIVATION. This new species is named after Mr. Josef Halperin, well-known Israeli specialist in xylophagous insects.

TYPE MATERIAL. Holotype (male): Israel, Southern Negev, loc. no. 5, N. Shelomo, 5 km W of Elat, 8.iv.1994, Volkovitsh & Dolgovskaya leg. Allotype (female): Israel, Southern Negev, Nahal Zihor, reared in August 1993 from branches of *Acacia gerrardii negevensis* collected in November 1992, J. Halperin leg. Paratypes: the same data as holotype (1 male). Israel, Southern Negev, loc. no. 6, Har Hizaryyahu, 800 m, 12 km NW of Elat, 9.iv.1994, Volkovitsh & Dolgovskaya leg. (1 male). The same data as allotype (3 males, 2 females). Israel (Southern Negev), Timna res., reared ex *Acacia*, M. Niehuis leg.



Figs 1–2. 1 – *Chalcogenia halperini* sp. n., holotype, 10.0 mm; 2 – adult larva of *C. halperini* sp. n., 22.0 mm.

(1 male) Israel, Central Negev, Mizpe Ramon, ex larvae, 15 vii.–15.viii.1995, from *Acacia gerrardii negevensis*, G. Magnani leg. (5 males, 8 females) Israel, Central Negev, Mizpe Ramon, ex larvae 11.viii 1995 from *Acacia gerrardii negevensis*, G Sama leg (2 males, 2 females). Israel, Arava Valley, Moshaav Hazeva, wadi Shahak, between agricultural fields, –110 m, Sharkey malaise trap, 5.v.1995, M E. Irwin, 30°46.33 N, 35°16 32 E (GPS) (1 female) Israel, Arava Valley, 4 km NE Hazeva Field School, Nahal Iddan, –400 ft , 28.iv.1996, M. E Irwin, 30° 47 38 N, 35°16 07 E (2 females) Israel, Hazeva, 15 viii 1959, J Halperin (2 males) Israel Arava Valley, Iddan, side waddi bellow date orchard, –640 ft malaise trap, 6 v 1996, M E Irwin, 30°49 05 N, 35°16 55 E (1 female). Israel, Arava Valley, Nahal Omer, ex larvae 5 viii 1995 from *Acacia raddiana*, G Magnani leg (1 male, 2 females) Israel, Arava Valley, Nahar Omer, ex larvae 8.ix. 1995 from *Acacia raddiana*, G Sama leg (1 male, 1 female). Israel, Arava Valley, Yotvata, ex larvae 1.vii –20 viii. 1995 from *Acacia tortilis*, G Magnani leg (3 males, 1 female) Israel, Arava Valley, Yotvata, ex larva vi 1995 from *Acacia tortilis*, G. Sama leg (1 female) Israel, Dead Sea Area, loc no 25, N David, En Gedi env. 21.iv 1994, Volkovitsh & Dolgovskaya leg., from dead branches of *Acacia* sp. (1 dead specimen) Israel (Palestine), Ejn Hosb, 3 v 19 , Burasch leg – *Chalcogenia theryi* Abeille, det Dr Obenberger (1 female) Israel (Palestine), Wadi Fukra, e. l., 10 v 19 , ex *Acacia spirocarpa*, leg Bytinski-Salz (2 males, 1 female) Egypt, Sinai, Wadi Feirah, 9.iv 1973, *Acacia*, leg. Bytinski-Salz (1 female) Jordan, Wadi Ghuba, 9 v 1995, K. Denš sen leg (2 males, 3 females) Jordan mer occ , 20 m, 5 km S Aqaba, 29°24 N, 34°59 E, 3 iv 1994, leg S Bečvář j. & s (1 male, 1 female) No locality label, *Acacia spirocarpa* (1 male, 1 female). Holotype and allotype deposited in TAUI, paratypes in TAUI, ZMAS, NMPC, GMCC, MNAC, RLWE, SPBC, VKBC

DISTRIBUTION. Israel (Southern Negev, Central Negev, Arava Valley, Dead Sea Area), Egypt (Sinai), Jordania.

BIONOMY. Larvae of this species develope under the bark and inside the wood of trunks and branches of various *Acacia* species: *A. gerrardii negevensis*, *A. raddiana*, *A. tortilis* and *A. spirocarpa*.

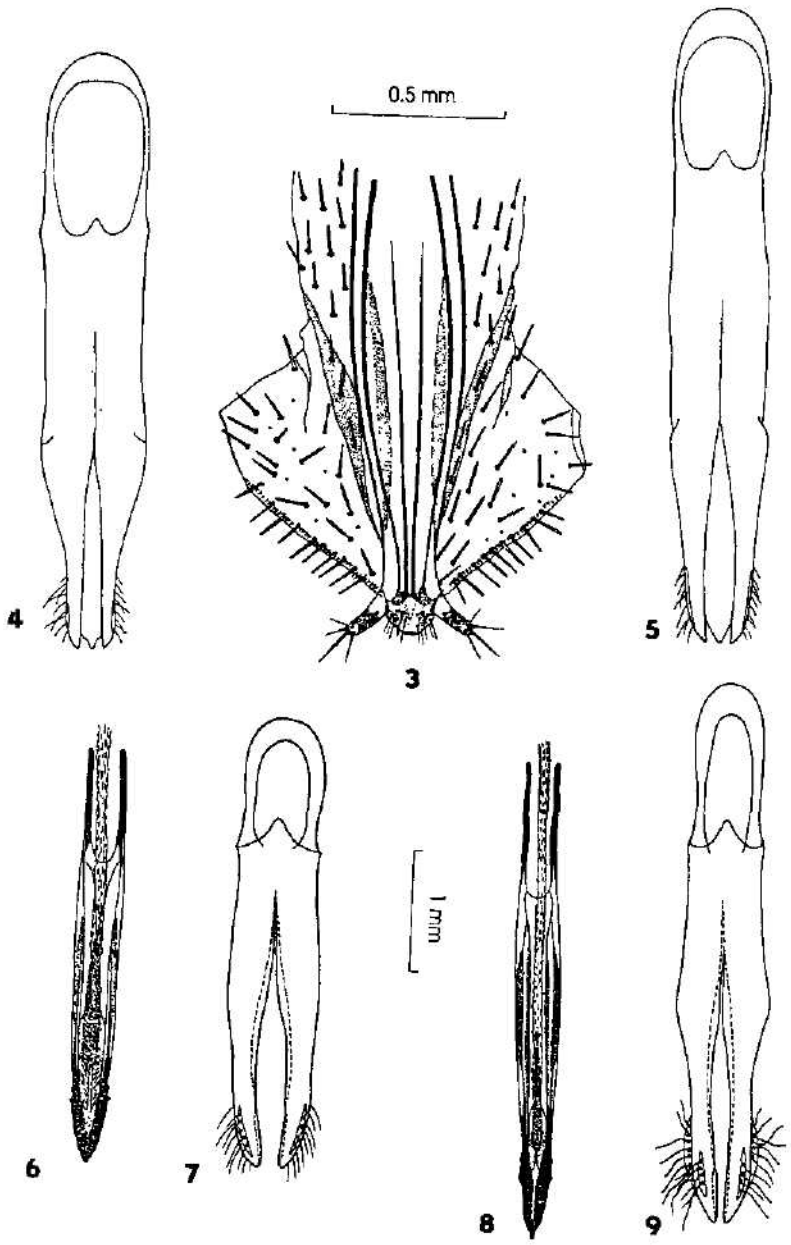
DIFFERENTIAL DIAGNOSIS. Within *Chalcogenia* we can distinguish two different groups: the most of species belong to the group which is characterized by slender, flattened body, smooth elytra without longitudinal carinae or with indistinct, slightly developed carinae and not enlarged or very slightly enlarged male femurs; species belonging to this group are often metallic-green or blue, or brightly cupreous and males have not any conspicuous pubescence on inner margin of tibiae or femurs. The second group includes only four species: *C. sulcipennis* (Gory, 1841), *C. femorata* Kerremans, 1908, *C. argodi* Kerremans, 1909 and *C. halperini* sp. n. This small group is characterized by rather convex, distinctly cuneiform body, well-developed and lustrous, longitudinal elytral keels, strongly enlarged male metafemurs and long, brush-like pubescence on inner margin of femurs or femurs and tibiae.

C. halperini sp. n differs from *C. sulcipennis* (South Africa), *C. femorata* (Tanzania) and *C. argodi* (Somalia, Ethiopia) apart from its distribution by short and sharp spines on all trochanters of male, by the shape of metatibiae, form of aedeagus, long, brush-like pubescence of male femurs and tibiae (only femurs with long pubescence in males of *C. sulcipennis* and *C. argodi*) and slightly by sculpture of hind pronotal angles (large, deep punctures with central grains in *C. halperini* sp. n. and simple, somewhat transverse punctures in *C. sulcipennis* and *C. argodi*). *C. halperini* sp. n. also differs from both species mentioned above by its bronze colouration (black body with red-bronze pronotal angles in *C. argodi* and black body with bronze elytral interstices in *C. sulcipennis*) and by narrower and less elevated elytral keels.

Description of larva

MATERIAL EXAMINED (4 larvae) Israel, Nahal Zihor, 12 x 1991, from branches of *Acacia gerrardii negevensis*, J Halperin leg (1 larva) Israel, Nahal Zihor, from branches of *Acacia gerrardii negevensis*, 15.viii 1992, J. Halperin leg (3 larvae).

Length of the different instar larvae: 9–22 mm. Larva (Fig. 2) is of the usual buprestid type with strongly enlarged prothorax, corresponding to the 1st morpho-ecological type of *Acmaeoderella* Cobos, larva (Volkovitsh 1979).



Figs 3–9. 3 – ovipositor of *Chalcogenia halpernni* sp. n.; 4 – aedeagus of *C. argodi* Kerremans.; 5 – the same, *C. sulcipennis* (Gory); 6 – *C. theryi* Abeille, medial lobe; 7 – the same, tegmen; 8 – *C. halpernni* sp. n., median lobe; 9 – the same, tegmen.

HEAD AND MOUTHPARTS. Epistome (Fig. 10) 5.1–5.7 times as wide as long; anterior margin hardly arcuately bisinuous between the semiglobular mandibular condyles; posterior margin slightly bisinuous, nearly straight; lateroposterior corners blunt, weakly obtuse-angled, nearly rectangular and hardly projecting; lateral margins with deep antennal incissions. Epistome bearing 2 groups of 3 epistomal sensillae (Fig. 10, es) arranged linearly at the anterior third of epistomal length, divided by slightly sclerotized strip in the middle; each group consists of 2 short, trichoid sensillae medially and 1 campaniform sensilla laterally arising from the common basis. Clypeus (Fig. 11) narrow, membranous and glabrous, with anterior margin nearly straight.

Labrum (Fig. 11) trapezoid; anterior margin nearly straight between rounded antero-lateral corners, without lateral lobes, with straight sides, markedly converging posteriorly. Palantine sclerites well-developed, transverse and sclerotized with well-developed, strongly sclerotized lateral branches and poorly developed, short medial ones (Fig. 11, mb) (terminology according to Volkovitsh & Hawkeswood 1994). Each of medial branches bearing dorsally 3 medial sensillae of labrum (Fig. 11, msl): 1 short apical seta which hardly extends the anterior third of labrum and 2 campaniform sensillae situated below apical seta posteriorly the middle line of labrum on the same level; the distance between apical seta and both campaniform sensillae slightly more than that between them. Anterolateral sensillae (Fig. 11, alsl) include 2 sharp setae and 2 campaniform sensillae externally and 2 short setae near the anterolateral margin on each side internally. The position of anterolateral sensillae is as follows:

$$\frac{(1c,\ 2c,\ 3t) + 4t}{1t + 2t}$$

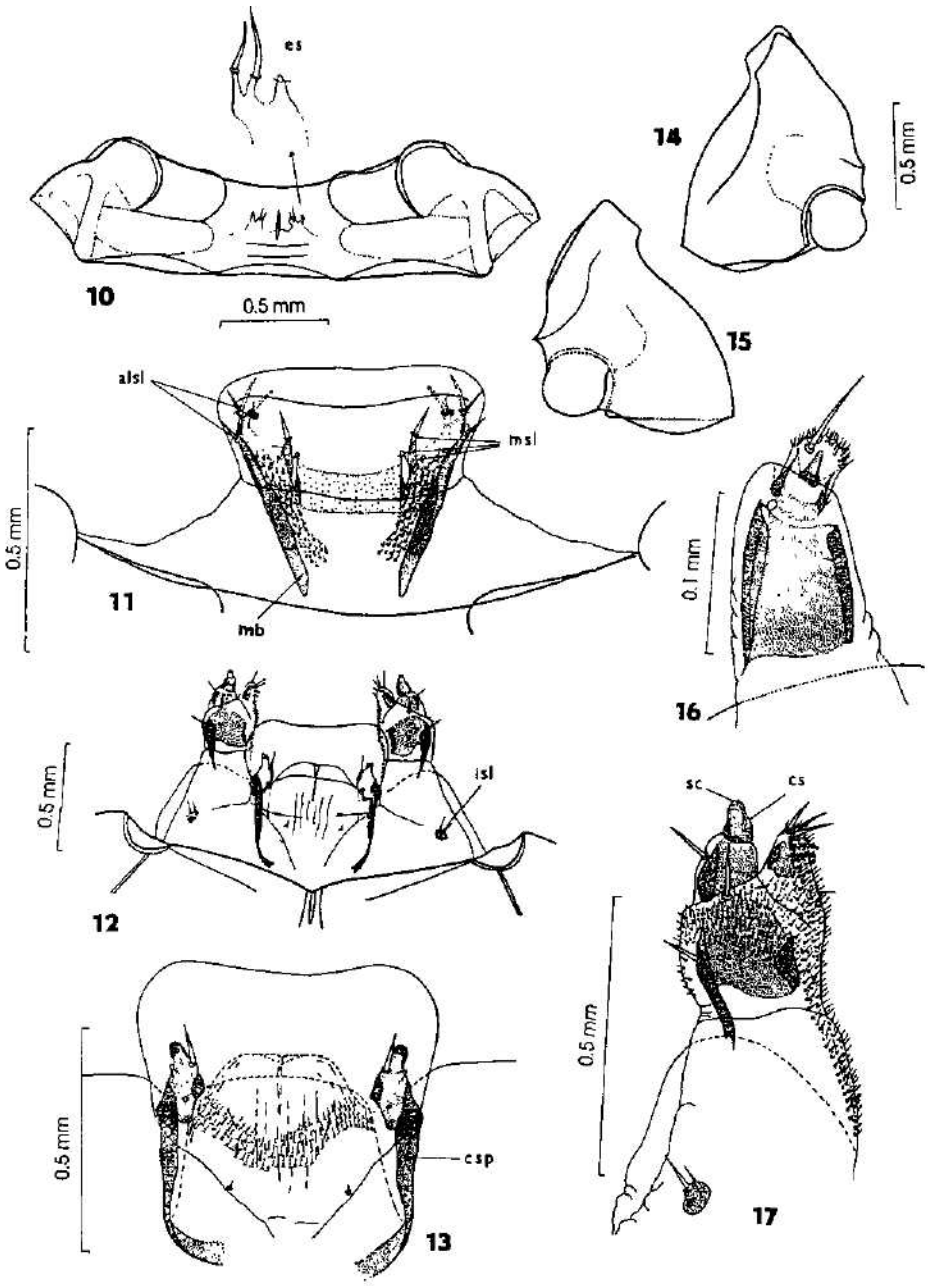
with external sensillae designations in the numerator and internal ones in denominator (1, 2, 3,... – the ordinal number of sensilla from the most medial to lateral ones; t – trichoid, c – campaniform sensillae; „( )" – with fused bases, „+" – with closed bases, „–" – with distant bases (Volkovitsh & Hawkeswood 1994). External surface of labrum glabrous; epipharynx laterally with indistinct microspinulae surrounding the pharynx.

Antennae (Fig. 16): 2-segmented, situated in the deep lateral depression of epistome; articular membrane glabrous, forming a cover in which whole 1st and base of 2nd segments are sunk. First segment cylindrical, slightly narrowed towards the apex, 2 times as long as segment 2 and about 2 times as long as wide, strongly sclerotized; anterior margin glabrous with a campaniform sensilla externally at the middle and another one internally near the apex of internal margin. Second segment cylindrical, about 1.5 times as long as wide with normally developed inner sclerites, with fine microspinulae at the anterior margin and with short trichosensilla length of which is approximately equal to the length of the 2nd segment; apical cavity bearing sensory appendage and 2 hardly visible palmate sensillae at the basis of sensory appendage, the bottom of the cavity situated in the anterior half of 2nd segment.

Mandibles (Figs 14, 15): black, strongly sclerotized, broadened at the basis, triangular and slightly longer than wide. Cutting edge with dorsal and ventral ridges separated by deep incission, without apical tooth.

Hypostome. Slightly sclerotized except of lateral parts, bearing numerous short and indistinct trichoid and campaniform sensillae situated on the middle part of hypostome, these sensillae are missing in younger larva; pleurostome without any traces of ocelli.

Labiomaxillary complex (Figs 12, 13, 17). Maxillae (Fig. 17): maxillar cardo membranous, glabrous, with 2 short setae and 1 campaniform sensilla situated on a distinct, isolated, well-sclerotized sclerite (Fig. 12, isl) at the posterolateral corners near the cardo basis. Stipes with strongly sclerotized internal sclerite bearing one campaniform sensilla closer to external margin, one short, sharp seta at the external margin of internal sclerite and one short, sharp seta



Figs 10–17. Larva of *Chalcogenia halperini* sp. n. 10 – epistome (cs – epistomal sensillae); 11 – labrum and clypeus (alsl – anterolateral sensillae of labrum, mb – median branch of palantinae sclerite, msl – median sensillae of labrum); 12 – labiomaxillary complex (isl – isolated sclerite of labrum); 13 – labium (csp – corner sclerite of prementum); 14 – right mandible, ventral view; 15 – the same, dorsal view; 16 – right antenna; 17 – left maxilla (cs – curved sensilla, sc – sensory cones).

near the anterior margin below the basis of maxillary palpus which does not extend the apex of 1st segment, anterior margin externally glabrous, external surface with microspinulae laterally, stipes internally with short dense microspinulae along external, internal and anterior margins, extending to the mala Maxillary palpus two-segmented, basal segment strongly sclerotized, rounded, bearing a long, sharp seta which extends to the apex of segment 2 and a campaniform sensilla, anterior margin of basal segment glabrous, second segment thickened above the basis, about 1 5 times as long as maximum width, markedly sclerotized with one long, modified and curved sensilla (Fig 17, cs) internally, one campaniform sensilla externally and about 8 small, conical sensillae (Fig 17, sc) at the apex Mala moderately sclerotized with broad internal sclerite, elongate, slightly narrowed to apex, about 1 5 times as long as wide, externally with one campaniform sensilla at the middle near internal margin, one long, sharp seta at the apex and two closed setae at the anterolateral margin, mala internally with three short, thick, curved and sclerotized spinae at the anterior part and 1–2 non-sclerotized, straight setae along internal margin and with rather dense microspinulae

Labium (Fig 13) strongly transverse, prementum about twice as wide as long with markedly emarginate anterior margin, broadly rounded anterolateral corners and lateral sides feebly converging posteriorly, external surface of prementum quite glabrous, internal surface only with indistinct microspinulae along the lateral sides, each corner sclerite of prementum (Fig 13, csp) bearing one short, sharp seta extending to about anterior third and 5 small, campaniform sensillae, postmentum with two indistinct campaniform sensillae

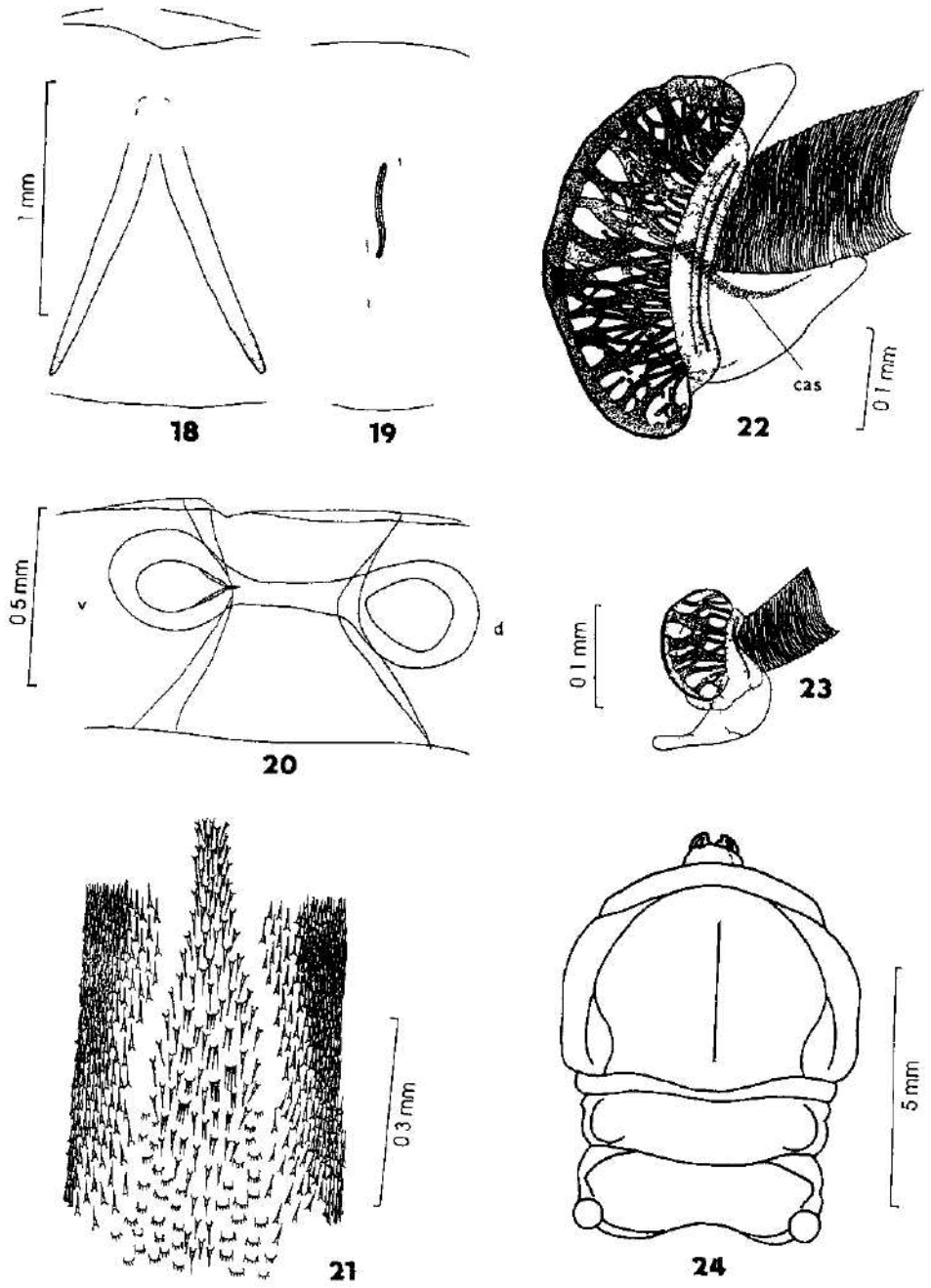
Thorax (Figs 2, 24) Pronotal and prosternal plates poorly developed, glabrous, only with sparse, short bristles which are densest on prosternal plate and on the anterior and lateral parts of prothorax Prothoracic grooves (Figs 18, 19) yellowish or colourless, hardly sclerotized, pronotal groove (Fig 18) inverted V-shaped dividing into 2 nearly straight branches at apex, forming the sharp angle about 40^0 grades, prosternal groove (Fig 19) narrow, colourless, distinct only in its middle part Mesothorax without distinct ambulatory pads on the both sides, glabrous Metathorax with small, well-developed ambulatory pads both on dorsal and ventral sides which are connected by inner structures (Fig 20) (see also Volkovitsh & Hawkeswood, 1987, Fig 18), these structures are the main character of larvae of Anthaxiini Thoracic segments glabrous, only with short bristles

Abdomen (Fig 2) Abdominal segments slightly transverse, flattened, with longitudinal, depressed zones laterally, glabrous First segment wider than 2–10 segments, without ambulatory pads Segments 2–9 also without ambulatory pads, irregularly covered with sparse, short bristles which are denser on their lateral margins

Spiracles (Figs 22, 23) Thoracic spiracles (Fig 22) reniform, about 3 times as long as wide with very dense branching inner trabeculae, the closing apparatus of spiracles (Fig 22, cas) not sclerotized Abdominal spiracles (Fig 23) variable in size, reniform, oval or irregular in shape, about 1 5 times as long as wide, they differ from thoracic ones only in the shape and size

Proventriculus (Fig 21) The morphology of the inner fields and their armature are typical for Anthaxiini, the armature includes microspinulae and microsetae, forming a complicate pattern which is rather similar to that of *Anthaxia* (*Cratomerus* Solier, 1833) (Soldatova 1970, fig 3, 1973, fig 1, Bily 1975, figs 52, 54, 55)

Larvae of *Chalcogenia* are very similar to larvae of Anthaxiini in all respects We have failed to find the reliable larval characters which would separate the genera *Chalcogenia* and *Anthaxia* sensu lato Some differences are as follows



Figs 18–24 Larva of *Chalcogenia halperini* sp n 18 – pronotal groove, 19 – prosternal groove, 20 – ambulatory pads of metathorax (d – dorsal, v – ventral), 21 – medial band of dorsal surface of proventriculus 22 – mesothoracic spiracle (cas – closing apparatus), 23 – 1st abdominal spiracle, 24 – prothorax of adult larva, ventral view

Chalcogenia

Epistome bearing 3 epistomal sensillae arising from the common base in each group 2 short trichoid ones medially and 1 campaniform sensilla laterally (Fig 10)

The bottom of apical cavity of the second segment of maxillary palpus situated in the anterior half of the 2nd segment, 2nd segment with normally developed inner sclerites, it does not form the tube, its anterior margin microspinuled

Internal surface of stipes and mala covered with dense microspinulae

Anthaxia

Epistome bearing 2–4 epistomal sensillae in each group 1–2 short trichoid (or campaniform) medially and 1–2 campaniform sensillae laterally (only lateral sensillae if they are 2) arise from the common base

The bottom of apical cavity of the second segment of maxillary palpus situated at the bottom of 2nd or in the middle of 1st segment (Volkovitsh & Hawkeswood 1994, fig 18), 2nd segment with rudiments of inner sclerites at the base or without them forming the tube, its anterior margin glabrous

Internal surface of stipes and mala covered with sparse microspinulae or nearly glabrous

The differences between larvae of Anthaxiini, Kisanthobiini and Melanophilini are shown in the Table 1 There is obvious that larvae of *Chalcogenia* have nothing in common with those of Kisanthobiini and Melanophilini

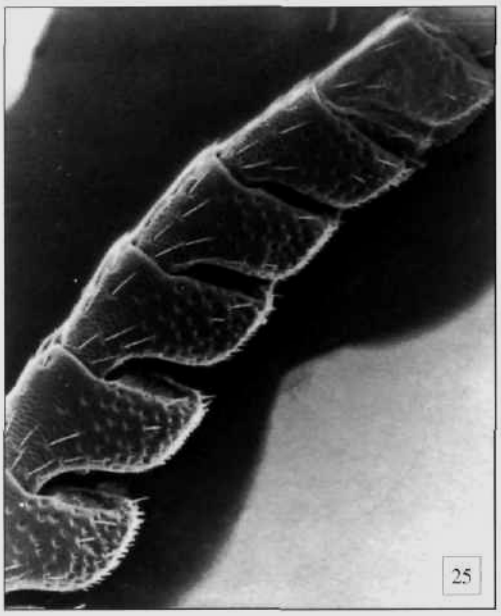
DISCUSSION

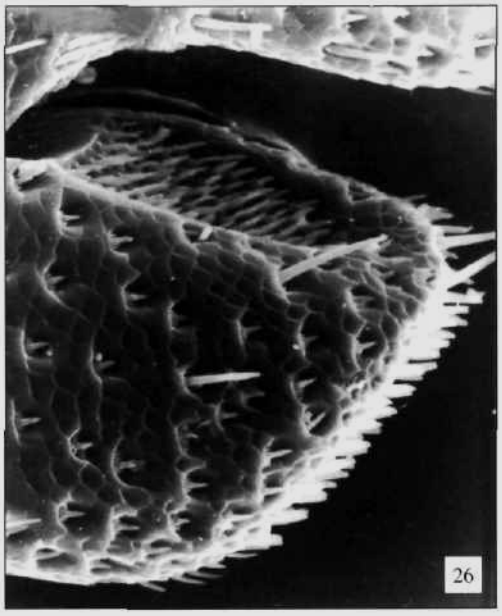
The generic name *Chalcogenia* was suggested for the first time by Saunders (1871) for two species *Evagora sulcipennis* Gory, 1841 and *Anthaxia contempta* Mannerheim, 1837 Since this name was not accompanied with any descriptions subsequent authors attributed the authorship to Thomson (1879), who gave the generic description and designated *Anthaxia cuprea* Gory & Laporte, 1839 (= *A contempta* Mannh) as the type species According to the Article 12b (5) (ICZN 1985) the authorship of generic name *Chalcogenia* should be attributed to Saunders (1871)

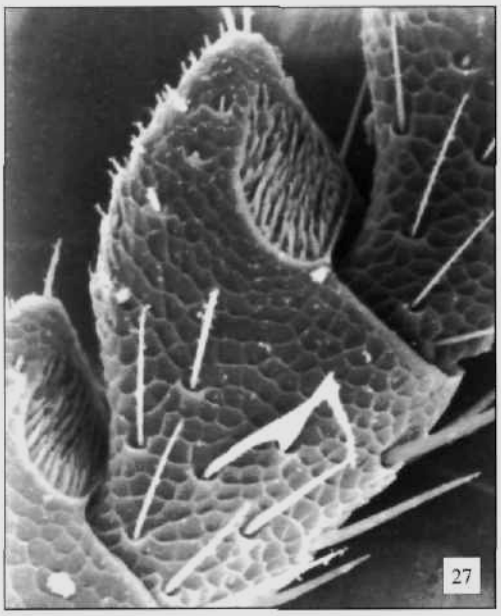
Kerremans (1903) placed *Chalcogenia* to the group Anthaxites of the tribe Buprestini, Thery (1928) and Obenberger (1930) shared this opinion Latter on, this genus was placed to Melanophilini (Bellamy 1985, Holynski 1993) The comparative study of antennal and larval morphology as well as many external characters and male genital structure have demonstrated undoubtely that *Chalcogenia* belongs to Anthaxiini

The antennal structures are shown on Figs 25–32 The principal character of Anthaxiini is the disposition of sensory pit at the middle of apical surface of antenomeres (Figs 25–30) Melanophilini are characterized by apical cavities (Figs 31, 32) which are completely or nearly completely closed Very interesting pattern of antennal structure was found in African *Brachanthaxia* (Fig 30) which looks like that of some Australian genera traditionally attributed to Anthaxiini or Melanophilini it has apical sensory pit covered from above with a lobe which is an extending lobe of the inner margin of the pit itself (the analogous sensory organs of Australian genera originated as a result of the invagination of sensory pits) It is obvious that the antennal structure of *Chalcogenia* (Figs 18–19) is the same as in Anthaxiini (Figs 27–32), being more similar to *Anthaxia iliensis* Obenberger, 1914

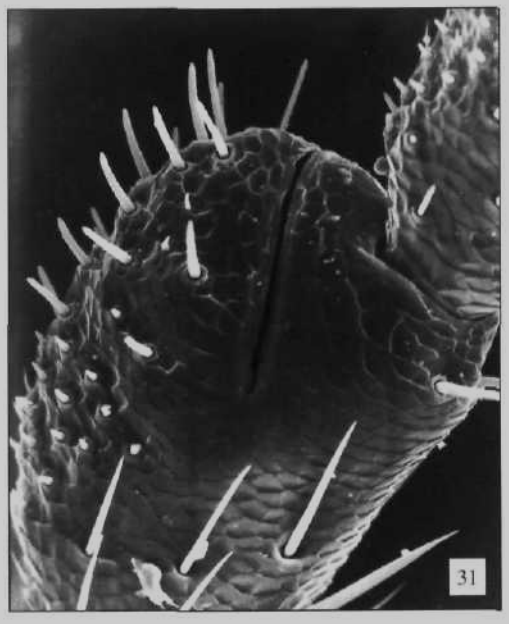
The larval structures of *Chalcogenia* are the same as in *Anthaxia* We have failed to find any reliable characters which could be regarded as generic besides some unreliable differences in the number of epistomal sensillae and the disposition of the bottom of apical cavity of maxillar







Figs 25–28. Antennal structures. 25 – *Chalcogenia contempta* (Klug), 6–11 segments, internal view, ×130; 26 – the same, 7th segment, ×600; 27 – *Anthaxia illiensis* Obenberger, 6th segment, internal view, ×400; 28 – *A. vittula* Kiesenwetter., 7–8th segments, internal view, ×350.



Figs 29–32. Antennal structures. 29 – *Brachelytrium transvaalense* Obenberger, 8–11th segments, internal view, ×250; 30 – *Brachanthaxia gemmata* Gory & Laporte, 6–11th segments, internal view, ×350; 31 – *Phaenops guttulata* (Gebler), 10th segment, internal view, ×450; 32 – *Melanophila picta* (Fabricius), 11th segment, internal view, ×450.

Table 1 Comparison of the main taxonomic characters between the larvae of Kisanthobiini (*Kisanthobia*), Anthaxiini (*Anthaxia, Cratomerus, Chalcogenia*) and Melanophilini (*Melanophila Phaenops*) (*)

Character	Kisanthobiini	Anthaxiini	Melanophilini
Antena (**)	Situated in lateral incission between epistome and hypostome (pleurostome), articular membrane glabrous, not forming a cover around 1st segment, with dense microsetae on the anterior margins of segments 1 and 2, bottom of apical cavity extending to about the basis of segment 2	Situated in lateral depression of epistome, articular membrane glabrous, forming a cover, in which whole 1st and basis of 2nd segments are sunk, without microspinulae or microsetae on the anterior margins of segments 1 or both 1 and 2, bottom of apical cavity may extend to the middle of segment 1 (Fig 16, see also Volkovitsh & Hawkeswood 1994, Fig 18)	Situated in lateral incission between epistome and hypostome (pleurostome), articular membrane covered with microspinulae, not forming a cover around 1st segment, with very dense microsetae on the anterior margins of segments 1 and 2, bottom of apical cavity extending to about basis of segment 2
Labrum	Externally with dense microsetae along the entire anterior margin, epipharynx with narrow strips of microspinulae (Alekseev & Soldatova 1968, Fig 3)	Externally glabrous, epipharynx with sparse, indistinct microspinulae or glabrous (Bily 1975, Figs 33-40)	Externally with very dense microsetae along the entire anterior margin, the most of epipharynx with the same microsetae
Labrum anterolateral sensillae	(1t,2c)-3t-4t (1t,2t,3t)	(1c,2c,3t)+4t 1t+2t	(1t,2c)+3t-4t (1t,2t)
Mandibles	With 2 ridges of blunt teeth arising in pairs on common bases	With 2 ridges without teeth or with hardly developed teeth (Bily 1975, Figs 25-32)	With 2 sharp teeth at apex
Labium prementum	With microsetae externally, with hardly visible microspinulae along lateral margin internally (Alekseev & Soldatova 1968, Fig 3)	Externally and internally glabrous (Bily 1975, Figs 41–48)	With microsetae externally, with dense microsetae covering the most of surface internally
Prothoracic plates	Glabrous, except of small zones of microspinulae on the anterior and posterior margins (Alekseev & Soldatova 1968, Fig 2)	Glabrous	Centrally densely, regularly covered with strongly, evenly sclerotized, scalelike asperities, surrounded by microteeth (Volkovitsh & Hawkeswood 1994, Fig 17)
Metathorax	Withouth distinct ambulatory pads (Alekseev & Soldatova 1968, Fig 2)	With well-defined ambulatory pads on both dorsal and ventral surfaces, connected by inner structures (Volkovitsh & Hawkeswood 1987, Fig 18)	Without distinct ambulatory pads (Alekseev & Soldatova 1968, Fig 2)
Body surface	Mainly glabrous, with sparse setae and narrow zones of poorly developed microspinulae and tubercles	Mainly glabrous with very sparse setae and indistinct zones of microspinulae	Almost totally covered with microteeth, with setae laterally

(continuation on the next page)

Proventricular fields of microteeth (***)	With developed, dense microteeth situated by groups or one by one on the tops of poorly sclerotized tubercles	With developed, dense microteeth situated by groups or one by one on the tops of sclerotized tubercles (Soldatova 1973, Figs 1-3; Bílý 1975, Figs 49-56)	With poorly sclerotized, sparse microteeth situated one by one or, rarely, by groups on the tops of unsclerotized tubercles (Soldatova 1969, Fig. 1)

(*) See also Alekseev & Soldatova 1968, Soldatova 1969, 1973, Bílý 1975, Volkovitsh & Hawkeswood 1987, 1993, 1994
(**) See for comments in Volkovitsh & Hawkeswood 1994, p. 24, footnote 6.
(***) See for comments in Volkovotsh & Hawkeswood 1994, p. 25, footnote 7

palpi. The differences between Anthaxiini, Melanophilini and Kisanthobiini are shown in the Table 1. It is obvious that *Chalcogenia* has nothing in common with both latter tribes. Some larval characters of *Chalcogenia* were also compared with Australian genera *Neocuris* Fairmaire, 1877 (Volkovitsh & Hawkeswood 1987), *Anilara* Thomson, 1879 (Volkovitsh & Hawkeswood 1993) and *Melobasis* Laporte & Gory, 1837 (Volkovitsh & Hawkeswood 1994); it was concluded that these taxa are not closely related to Anthaxiini or Melanophilini and that *Chalcogenia*, due to its larval characters, should be included to Anthaxiini.

Key to the African genera of Anthaxiini

1(4) Body short and stout, less than twice as long as wide; pronotal sculpture homogenous, consisting of regular, polygonal cells all over the whole pronotum, depressions at posterior pronotal corners very fine or missing, anal sternum 4 times as wide as long, its lateral margins slightly concave; prosternum convex; South Africa.

2(3) Elytra more convex completely covering pygidium, each elytron with 4 longitudinal, slightly elevate carinae, elytral epipleura not reaching elytral apex; pronotal sides convex, lateral pronotal margin double in posterior half; antennal sensory pits open; dark blue-green species . . . . . *Brachanthaxia* Théry, 1930

3(2) Elytra less convex, flattened, slightly uneven and shortened, not covering pygidium, elytral epipleura well-developed reaching elytral apex; pronotal sides straight or slightly incurved before posterior angles, lateral pronotal margin simple; antennal sensory pits nearly closed (Fig. 29); dark bronze species. . . . . *Brachelytrum* Obenberger, 1923

4(1) Body slender, 2.5–3.5 times as long as wide; pronotal sculpture consisting of simple punctures on disc and rounded cells at posterior corners or the sculpture is more complicate: polygonal or rounded cells which are indistinct at anterior pronotal margin, transverse wrinkles combined with polygonal cells, fine concentric or longitudinal wrinkles or combination of cells, transverse wrinkles or concentric wrinkles; depressions at posterior pronotal corners well-developed, anal sternum about twice as wide as long, its lateral margins straight or convex; prosternum flat or very slightly convex, whole African continent

5(6) Pronotal sculpture consisting of simple, fine punctures on disc and rougher, often umbilicate, punctures at posterior corners which can rarely form short and fine, longitudinal wrinkles; all abdominal sterna grooved medially, elytral epipleura flat or convex, shortened, reaching usually only hind third of elytra; large species (9–16 mm); whole African continent, Israel, Jordan. . . . . *Chalcogenia* Saunders, 1871

6(5) Pronotal sculpture never consisting of fine, simple punctures on disc being always more complicate: in the simplest case it consists of polygonal and rounded cells (with or without central grains) which are indistinct or missing near anterior pronotal margin but usually the pronotal sculpture consists of the combination of polygonal cells, transverse (rarely longitudinal) wrinkles or fine concentric lines; abdomen without medial groove, all sterna convex; elytral epipleura well-developed, usually groove-like, reaching or nearly reaching elytral apex; usually smaller species (3–12 mm); worldwide distribution (except of Australian region) . . . . . *Anthaxia* Eschscholtz, 1829

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In memoriam Professor František Sládeček
(November 16, 1916 – June 16, 1997)

František Sládeček was born on 16th November 1916 in Prague. After leaving examination at Czech Technical Secondary School in 1934 he studied forestry engineering (Technical University) in Prague and parallely zoology at the Faculty of Natural Sciences of Charles University in Prague. He graduated (RNDr) after the 2nd World War. Scientific degrees Ph.D. and DrSc he obtained in 1957 and 1967, respectively.

During the war he was employed as forest ingeneer. Already in 1945 he obtained the position of assistant and soon senior assistant and assistant professor of general zoology at the Faculty of Natural Sciences of Charles University in Prague. In 1961 he was appointed as professor of General and Experimental Zoology, since 1966 was the head of the Chair of General Zoology and Comparative Physiology. He retired in 1982. He lectured basic and advanced courses in cytology, histology, reproduction and development of animals and during last years of his activity in developmental biology.

Professor F. Sládeček was holding a number of University and Academy offices. He was dean of the Faculty of Biology (1954–1955), vice dean an head of biological section of the Faculty of Natural Sciences of Charles University in Prague (1956), vice-president (1972) and president (1976) of the Council of General Biology of the Czechoslovak Academy of Sciences and many others. He was member and later vice chairman and chairman of the Commission of biology teaching of the IUBS and member of the council of IUBS.

Prof. Sládeček started his scientific career with studies on symbiotic Ciliates in the rumen of deer and hormones of color change of fish. However, soon he concentrated his interest on experimental embryology and developmental biology of animals with Amphibian embryo as a model. In a short time he established a group which formed the basis of the Department of Developmental Biology, the first of this scientific orientation in this country. Graduates of the department represent a significant part of the personnel of university institutes , laboratories of Academy of sciences etc. A number of students from foreign countries obtained the degree after studies at this department. The scientific interest of Prof. Sládeček concentrated on different aspects of embryonic development of Amphibians on cellular a and organismal level, e. g. early development of central nervous system and development of his functions, questions of neural induction, experimental alterations of the fertilization processes with aspect to changes of ploidy, the significance of the number of cell generations for development, transplantation of nuclei of somatic cells into enucleated eggs (with some serological aspects). Later his collaborators extended field of interests of the Department on immunoembryology and chemical embryology. The results of his scientific activity qualified him for the election as a member of International Society of Developmental Biologists. His scientific and pedagogic work was awarded both Silver and Gold Mendel's Medal, Bronze and Silver Medal of Charles University and J. Ev. Purkinje Memorial Medal.

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